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ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXX. No. 3362. MAY 1, 1942 6d. WEEKLY

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ELECTRICAL REVIEW

Volume CXXX — No. 3362

Friday, May 1, 1942

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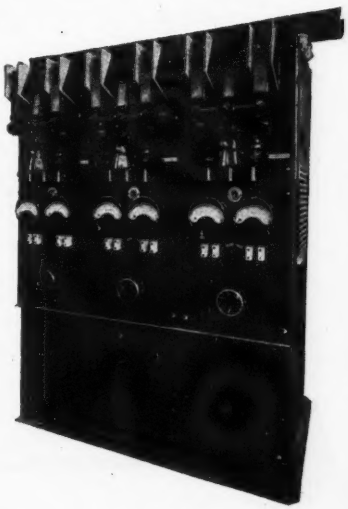

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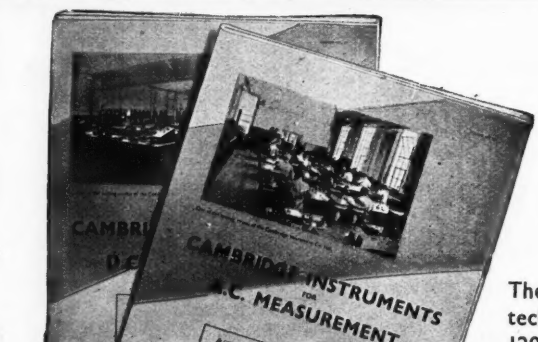

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ELECTRICAL REVIEW
THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3362. MAY 1, 1942 6d. WEEKLY

Rationing Proposals

Attempting the Impossible

AN endeavour is being made by the Government to right one wrong by introducing another. Having made a hash of coal production it is thought that the imposition of an impracticable rationing scheme upon domestic consumers will put things straight. It is obvious to all but those who see great virtue in every extension of State control that the proposed scheme will not work.

The "control for control's sake" school endeavoured to get going at the very beginning of the war, but after millions of forms had been printed, largely at the expense of the gas and electricity undertakings, and the time of thousands of people had been wasted, it was found that gas and electricity couldn't be rationed like coal and the plan was "suspended."

Diversity of Uses

Although the Government's handling of coal has led to a serious stringency and the need for saving fuel is imperative, the arguments against rationing gas and electricity are as potent as ever. It is practically impossible to ration intangible services, particularly where methods of use vary so widely from house to house and district to district. Nevertheless, on the advice of an eminent economist, the President of the Board of Trade is determined to try.

The proposals involve the introduction of "points," coupons being surrendered by the consumer for all coal, coke, gas, electricity and oil used. In an endeavour to meet the widely-varying habits and conditions to which we have referred each house will apparently have its separate assessment and in addition there will be "personal" allowances. Can a rationing scheme which takes each individual case into account be workable?

Again, it may be asked whether a plan for collecting coupons *after* consumption is feasible. Does the Minister think that millions of housewives will be able to spread their consumption evenly over the rationing period, keeping their eyes constantly upon their coal cellar and their gas and electricity meters? Hundreds of thousands of them will inevitably overstep their limits—and what is to happen then? They may have their next allowance docked; they may be fined (or even imprisoned); or they may be disconnected. Is the Government bold enough to risk the discontent and dislocation likely to result from the enforcement of any of these penalties?

More "Officials"

Such enforcement would mean a large "police force." It is useless to suggest that the ordinary meter readers would be adequate for the task, particularly when inexperienced women are being increasingly employed. The supply authorities are already hard pressed; is it wise to increase their troubles at this time?

Equivalents will provide another interesting problem. The 1939 Order stipulated that one ton of coal (calorific value not stated) was to be considered equal to 100 therms of gas and 1,400 kWh (or 10 million

and 4·8 million BThU respectively). The greater efficiency of use of electricity is acknowledged, but even so the comparison seemed a trifle flattering. Now the electrical equivalent is raised to 1,800 kWh. In mentioning all these points we are not being merely captious. We sincerely believe that the scheme is totally unworkable and had better be dropped. Instead, the appeals for economy, which we believe have not fallen on deaf ears, should be continued and endeavours should be made to increase the raising of coal of which we have abundance.

Not So Easy

TESTIMONY to the public faith in the adaptability of electric control devices is implied in the suggestions appearing in the lay Press as to how the rationing of electricity for domestic uses may be enforced. Some kind of automatic stop on the meters, it has been stated, will cut off the current when the ration has been used. Unfortunately no hint is given of the kind of circuit-breaker envisaged or how nine millions or so of them are to be manufactured, installed and adjusted to suit individual circumstances by the time rationing comes in. Particulars of the device will be awaited with interest.

Consequential Injury

MOST of the interest in the discussion on Mr. F. E. Butcher's paper before the Supervisors last week centred on the demonstrations of his simple protective circuit. During the split second taken to operate by a leakage trip in the earth connection, a voltage too low to give a serious electric shock may be enough, because of its unexpectedness, to cause a fall from a ladder or other injury to anyone carrying a faulty appliance. This circuit, which has been described by the author in our columns, is likely to have an especial value in present circumstances in its application to groups of portable tools.

Reliability and Cost

CONTRARY to the popular view, radio seems unlikely to prevent the use of cable for transoceanic telephony in any foreseeable future. Dr. O. E. Buckley gave very clear reasons in his Kelvin Lecture for regarding the two methods as complementary. If radio systems are cheaper to provide, they are more liable to disturbance by magnetic storms than cables are by mechanical breakdown and, in communications, speed and reliability rather than cost is the criterion. There appears to be no technical difficulty in meeting the requirements of the very much heavier traffic between London and New York that is to be anticipated in times to come.

Good Discussion

IT is a sign of healthy interest in the subject of a paper when a time limit has to be imposed on those taking part in its discussion. Valuable time has been saved by the I.E.E. vetoon individual thanks to the author, but more frequent opportunities would be provided for a larger number of members to express their views if every speaker took a little trouble to be concise by setting his ideas in order beforehand. In the foreword to the *I.E.E. Journal* for April, this point is aptly summed up in the aphorism that hard thinking makes easy expounding, just as hard writing makes easy reading.

Salvage

IF there is any concern of any size in the electrical industry which is not yet taking the matter of salvage really seriously it is about time it revised its ideas. We have had many serious losses among our sources of supply of essential materials and the shipping situation is such that we cannot afford to waste anything. It is not sufficient to issue injunctions to the staff, however frequent and persuasive. The salvage job must be the responsibility of an individual with the necessary drive and with sufficient assistance to enable him to do the work thoroughly. Apart from the national aspect, such an individual will "pay for his keep."

Penny Plates

SOME years ago Mr. J. Y. Fletcher, of the G.E.C., presented a large number of moulded collecting plates to the Electrical Industries Benevolent Association, the idea being that they should be passed round at every electrical gathering, everybody putting in a penny (no more). For some time after their introduction no electrical meeting was complete without them and the Association derived quite a handsome sum in this way. Nowadays, we regret, they are seldom seen and the E.I.B.A. suffers accordingly. This reminder may cause those who have the plates to bring them out of retirement for active service once again.

Reclaiming Rubber

Strenuous Duties Imposed on Electrical Equipment

AS announced last week the Ministry of Supply has inaugurated a national campaign for the collection and reclaiming of scrap rubber. Although it is only since the Japanese overran Malaya that the reclaiming of waste rubber has assumed such importance to the Allied cause, the process has been undertaken commercially for a number of years. Actually statistics available indicate that, prior to the war with Japan, the ratio of reclaimed rubber to raw plantation rubber (including latex) employed as a raw material in the world's rubber manufacturing industry was approximately 25 per cent. In this matter of reclamation the United States is considerably in advance of this country, producing "reclaim" to the extent of nearly one-third of its total raw material requirements, as compared with only about one fifteenth of requirements produced in the United Kingdom.

Strictly the expression "reclaiming rubber" is inaccurate since no material even remotely resembling raw rubber has yet been obtained from vulcanised rubber. What is, in fact, achieved by the reclaiming process is the replasticising of vulcanised rubber, which has in effect been converted from a material in which the elastic properties predominate over the plastic to one in which the plastic properties are more evident.

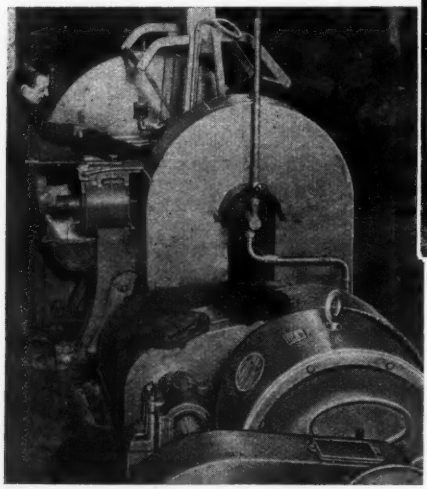
Since nearly all rubber processing depends on the thermo-plastic properties, replasticised vulcanised rubber will mix with raw rubber and does, in fact, simplify the processing of rubber compounds in several ways. For certain purposes it is preferable and it is, moreover, much more uniform than crude rubber, and its rate of cure is definitely faster. What was, in fact, originally regarded as a substitute and a cheapener in manufacture had even before the war established its advantages and had created a considerable demand "in its own right." This is clear from the fact that the price of "reclaim" has several times during recent years been quoted higher than that of crude rubber.

Practically any type of waste rubber can be reclaimed, the most important sources of raw materials

Above: Raw material awaiting treatment Right: The cracking machine, the first of the roller mills through which the rubber passes

being, of course, motor-vehicle and cycle tyres, together with other such articles as soles and heels, goloshes, hot water bottles, etc. A motor tyre which has been scrapped still contains a great deal of valuable material. Although in its use it may have lost most of its tread, the rubber that remains has not appreciably altered or deteriorated. The same applies to most other articles. In fact, most wear and tear in rubber articles generally is of a surface nature and does not extend through the mass of the material.

Recently we visited the works of Rubber Improvement, Ltd., to see how the reclaiming process is carried out, and in particular to discover in what ways electricity assists. Established in 1910, this company adopted its present methods of reclaiming in 1936, since

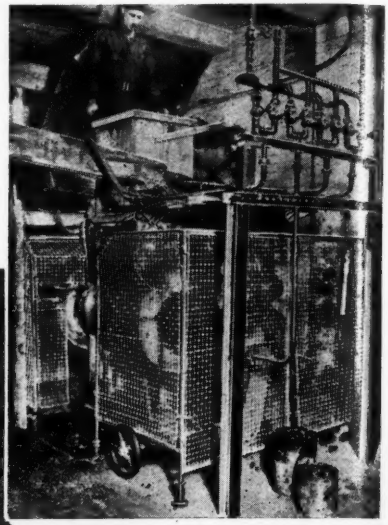


The scrap rubber is cut up into small pieces by means of this rotary cutter

when premises, plant and output have been increased tenfold.

On arrival at the factory the scrap rubber is sorted and graded. Motor tyres are de-beaded, and are either used in their entirety to produce "whole tyre" reclaim, or have the treads stripped off the carcass to produce a "tyre tread" reclaim. This stripping is carried out by a machine driven by a 5-HP Brook motor. On some occasions, the mechanical scrap rubber for reclaiming purposes, apart from tyres, is too large to pass through the breaking machines, and it is then cut up by a hydraulic bale cutter, which is oil-operated at a pressure of 1,500 lb. per sq. in., and driven by a 15-HP Brook motor, running at 1,000 RPM with an Electrical Apparatus Co.'s starter.

The material is then passed through a mill with fluted rolls, known as a cracking machine (driven by a 50-HP, 1,000-RPM Brook motor,



A digestor where the rubber is mixed up with chemicals and oils

with Allen West starter). This machine breaks up the rubber into pieces, which are then fed into the large rotary cutting machines running at 1,000 RPM, and operated by direct drive by Brook motors with Allen West starters. This latter plant draws the material through screens, to the correct size for the digestion process.

The comminuted rubber is then passed into large digestors, to which softening oils are added. The material is allowed to stay for twenty hours in these digestors in which high pressure steam is maintained for the whole period. The digestors are large vessels which turn slowly by means of worm and spur wheels throughout the whole heat process, ensuring homogeneous admixture of the oils and rubber. They are driven by 15-HP motors running at 960 RPM.

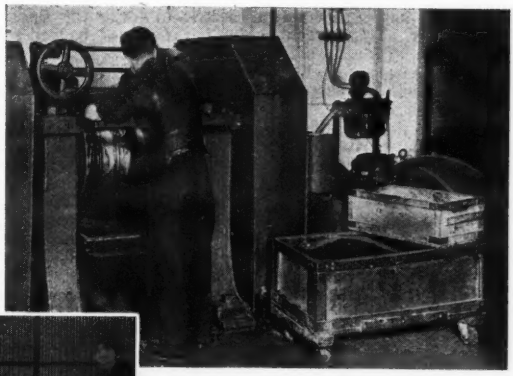
Plasticising and Refining

All the following stages of the process are concerned with the subsequent plasticising and refining of the heat-softened scrap, and electrical energy plays a very important part in this processing. After the material is discharged from the digestors it is milled on a machine with rollers 40 in. long, and driven through an extended shaft by a 75-HP,

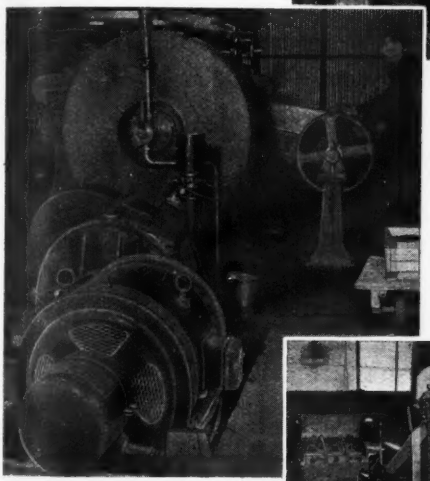
2-phase Electromotors unit, equipped with Ellison starters, running at 590 RPM.

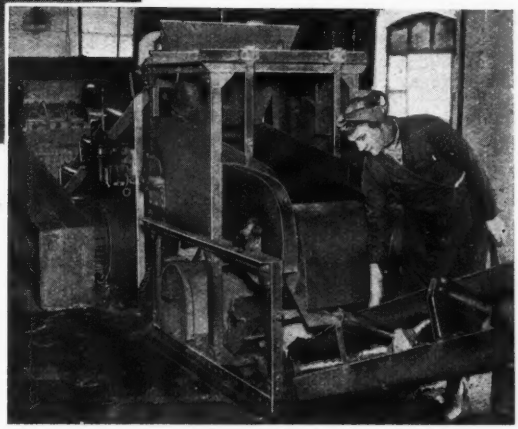
The milled material is then passed into a large internal masticating machine, which is fed from an elevated platform, and is driven by an 80-HP, 600-RPM Brook motor with E.A.C. starter. This machine plasticises the reclaimed rubber for approximately fifteen minutes, and when it is discharged it is in the form of a plastic mass, and suitable for final refining, straining and leafing processes.

The first refining process is carried out by another mill of the double-roller type, the rolls being squeezed together with great pressure in order to compress, break down and plasticise the particles of rubber. The refining process is so called because it removes the pieces of unsoftened scrap present in the reclaim, which



One of the refining mills





Above : A new leafing machine which has just been installed. Right : A magnetic separator for removing particles of metal from rubber powder

are left behind in the "bite" of the rolls, and are passed out at the edges.

The company uses two similar machines for this first refining process, driven through reduction gearing, one by a 75-HP, 590-RPM, 2-phase Electromotors machine, equipped with Ellison starter, and the other by a similar 50-HP, 700-RPM Electromotors unit.

After the scrap has been through the first refining operation it is passed through a strainer, similar to a tubing machine. This forces the scrap through a fine screen with an opening of 0·015–0·025 in. This screen removes any non-magnetic materials, such as copper or brass, which were not abstracted before digestion by the metallic separator, or traces of grit or other foreign bodies. This machine is driven by a 30-HP B.T.H. motor operated by an E.A.C. starter.

The final process, "leafing," consists of passing the strained reclaimed rubber through machines similar to the first refiners, but with rolls which are crowned

or cambered to produce a uniform sheet of rubber. This comes round on the back rolls, and it is deflected by the scraper or doctor blades, and is wound on a rotating drum to a convenient thickness.

The company possesses several of these leafing machines, and two of the most recent are operated respectively by a 50-HP, 720-RPM Brook motor with Ellison starter, and a 50-HP, 480-RPM English Electric motor and starter. This latter machine is the very latest type, and has only just been installed. A special feature is its solenoid operated brake for immediate stopping in the event of an emergency.

The reclaim has then passed through all the essential processes, and is cut off from the drum to form a square flat slab, which is dusted with talc. It is then supplied to the rubber manufacturers, and used in the production of new rubber articles.

Continuous Operation

As great pressure has to be used on all the mills to get the rollers tight enough for the purpose, and as the load fluctuates violently every time the rubber is passed through the rollers, it speaks well for the design and construction of the electric motors that breakdowns are very rare, and this too, despite the fact that all machines operate continuously throughout the twenty-four hours, except for a short break between shifts. Actually the Electromotors units driving the first refiners have not been repaired for electrical breakdown since the equipment was first installed in 1924.

Another very interesting feature is the water-cooling equipment which embodies centrifugal pumps, driven by Brook motors, running at 1,000 RPM, which operate continuously without stop, and these pumps supply water at a rate of approximately 1,000,000 gallons per week.

Compounds and Substitutes

In addition to supplying reclaimed rubber the company manufactures many important products, including rubber compounds, rubber substitutes and powdered rubber. A very modern plant has been laid out for the manufacture of this powdered rubber, and the material is not touched by hand from the time that it is fed into the first machine, until it is automatically bagged and ready for delivery.

The scrap rubber is fed into a rotary cutting machine, driven by a 35-HP, 1,000-RPM Brook motor. The graded cut pieces then pass up a conveyor to a magnetic separator, which abstracts any iron and steel present in the rubber. The 1½-HP, 1,400-RPM, 3-phase motor driving this machine also operates a DC generator for the electromagnets. The material is then passed to another conveyor which conveys it to a hopper from which it passes to a disc grinder, driven by a 35-HP, 1,000-RPM Brook motor. The material comes out of this grinder on to a slow moving conveyor belt, adapted for variable speed, on which it is cooled before being passed into sifting apparatus, driven by a 3½-HP, 750-RPM Brook motor.

The returns from the sifter are automatically passed back into the disc grinder, and the fines, which are then quite cool, are bagged ready for dispatch.

Each of the conveyors in this plant is equipped with a ¾-HP, 1,400-RPM "Neco" motor, and operated by Ellison starters. The atmosphere in this department is kept very clear by two Keith Blackman fans operated by ¼-HP motors, which draw in clean air at one end of the shop and expel dust at the other.

Altogether the company is now employing approximately 800 HP of electric motors; when extensions are completed the figure will rise to 1,400 HP. The main supply to the works is controlled by an 800-A Statter circuit-breaker, which is shortly to be duplicated to cope with proposed extensions. The sub-circuit breakers handle 400 A each and feed to various parts of the factory building. The main switchboard situated in the grinding shop is of Ellison construction.

In conclusion, we wish to thank Rubber Improvement, Ltd., for permitting us to visit its works for the purpose of compiling this article.

American Notes

THE *Electrical World* reports that the Hurley Machine Division of the Electric Household Utilities Corporation was recently ordered to suspend the production and sale of electric washing and ironing machines. The quota under Limitation Orders for the last four months of 1941 was 44,376 machines. The Hurley Machine Division "with full knowledge of this restriction" produced 76,770 washing machines and ironers. The order made suspends production until August 1st next unless resumption is specifically authorised by the Director of Industry Operations.

It is reported by *The Times* that machinery and equipment needed to complete the Rio Negro hydro-electric scheme in Uruguay are to be manufactured in the United States, which has agreed to put them on the priority list. The scheme was begun by the German Siemens concern in 1937, but they could not finish it because of the British blockade.

Although in the decade ending in 1939 there was a decline in the total number of farms in the United States—from 6,288,648 to 6,096,799, the *Edison Electric Institute Bulletin* shows that the number electrified increased from 845,356 to 2,032,316. The term "farm" appears to cover what we would call small holdings in this country, for it is noted that 1,145,005 of the total had incomes of under $250.

Resistance Furnaces

Varied Types for Almost Every Purpose

By Verdon O. Cutts

WHEN a full account of the part which electric furnaces are playing in the prosecution of the war can be published it will reveal a diversity and extent of application and a record of achievement which will be very impressive. Incidentally, it will also suggest an equally wide range of application to peace-time requirements, accompanied by a degree of accuracy and precision which, in many cases, was not formerly considered necessary.

Many works normally engaged on engineering and metallurgical work which did not call for close tolerances have now turned to very precise war work which is subjected to the closest inspection and test. Such works will often retain their new-found and more exact works practice and methods—some for peace-time and reconstruction work which require it, and some to improve normal products previously made with less precision.

Electric furnaces have facilitated the development of greatly improved physical properties of materials which are, in consequence, capable of withstanding wear and tear to an extent hitherto not considered possible. This results from the ability to work exactly to a predetermined temperature, to control surface conditions such as hardness, to eliminate distortion during heat treatment and to get perfectly bright and full annealing or really clean hardening of components. This precision, which is comparable with that of the laboratory, is easily obtained with electric furnaces under ordinary commercial production conditions, with but little dependence upon skilled labour or even on the close attention and assiduity of furnace attendants.

Mr. V. O. Cutts

War production conditions have presented the opportunity for developing and applying electric furnaces to new industries and for new purposes. During the last war the electric-arc furnace made conspicuous headway and was established as a convenient and economical steel-melting and refining furnace, working mainly on charges of scrap. Many purely engineering firms experienced such difficulty in getting steel castings that they built and equipped electric-steel foundries which utilised in arc furnaces the large accumulations of scrap produced in their own busy and often considerably enlarged machine shops. During the present war there has also been a considerable growth in the number of installations of electric melting furnaces of both the resistance and high-frequency induction types.

Charge of crankshafts suspended from the underside of a furnace cover

Resistance furnaces are being used for melting some of the non-ferrous metals and alloys. High-frequency induction furnaces are being used to an increasing extent for making both ferrous and non-ferrous alloys of exact predetermined analysis under ideal metallurgical conditions. The electro-dynamic forces set up within the molten charge, which are an inherent characteristic of high-frequency furnaces, ensure a thorough alloying of the constituent metals. Consequently the resultant alloy is perfectly uniform throughout. Melting is done under ideally clean

conditions which preclude the possibility of adventitious additions of deleterious elements or any appreciable modification of composition through oxidation. These advantages are achieved with economy and on a considerable production scale.

It is, however, the electric resistance furnace which has probably made the greatest strides and which is helping the war effort most conspicuously. Many thousands of batch-type furnaces, working with a natural atmosphere which is not disturbed except by natural convection, are in operation for 168 hours per week and 52 weeks per year in the production of essential armaments and components. This applies equally to thousands of other resistance furnaces in which the charge is conveyed through the furnace mechanically or in which either forced-air circulation or artificial atmospheres are used.

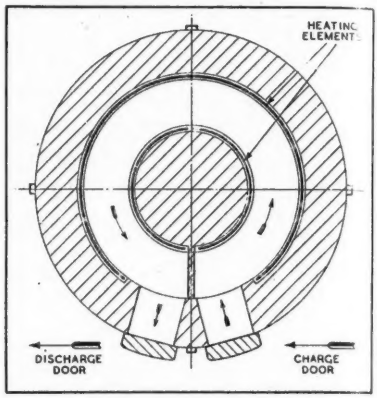
An Ideal Load

Resistance furnaces are an ideal load from both the user's and the supply engineer's points of view. Frequently they reduce the average cost of electricity throughout a works, since the load is a steady one at practically unity power factor, thus increasing the average or overall power factor of the whole plant. Full load is usually on without any variation until the predetermined temperature is attained, after which current is switched on and off at the dictates of the automatic temperature-control gear.

Where the soaking or holding period is prolonged the load, which is switched on and off automatically, is usually reduced either by a series-parallel arrangement or star-delta switching. In other cases part of the elements is switched out during this period. Thus a high load factor is assured. Where continuous furnaces are used, the load factor is often 100 per cent. while the furnace is working, which is usually for twenty-four hours a day.

Many very large works depend entirely upon electric furnaces for heat-treatment because their operating costs per ton of output are less than those of the fuel-fired furnaces which they displaced. In these and many other instances there is the additional advantage of improved physical properties obtained consistently under precise control. Another feature peculiar to the resistance furnace, which has not hitherto been sufficiently emphasised, is that methods of supporting a charge of work within the furnace can be used which are not practicable with any other type of furnace.

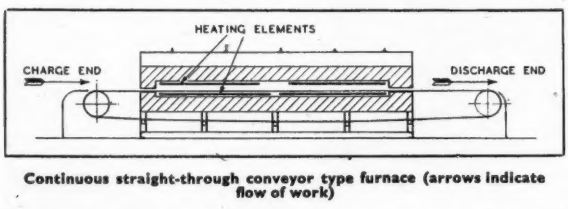
Distortion is thus reduced to a minimum,



Continuous rotary-hearth type furnace (arrows indicate flow of work)

the proper charging of the furnace is done much more quickly and with less dependence upon the skill and care of workmen, and the weight of extraneous metal used for supporting the charge is considerably reduced. All this makes for economy and a consistent flow of work. Such a method is not possible in other types of furnaces which work with comparatively steep temperature gradients because material cannot be obtained of sufficient strength to support comparable suspended loads at the higher temperatures prevailing in them.

Forced-air circulation by means of electrically driven fans is being used to an increasing extent in both rectangular and vertical cylinder furnaces designed to work at low and moderate temperatures. This feature is no longer restricted to small furnaces but has been successfully applied to very large furnaces having a heavy electrical input. The principal effect of forced-air circulation is a quick equalisation of temperature throughout the charge. In this connection it should be borne in mind that there are many furnace processes in which the ultimate attainment of uniform temperature is not enough, as it is essential that every part of the charge shall be maintained at a predetermined temperature for the same length of time



Continuous straight-through conveyor type furnace (arrows indicate flow of work)

without any part of it ever exceeding that temperature. In most of these cases heating by convection is infinitely preferable to heating by radiation.

The independence of electric resistance furnaces of flue positions, etc., has made it possible to install them in the line of production, and this has encouraged the development of several types of continuous furnaces. These are of two main kinds, viz., the straight-through type occupying a long and narrow site with charging and discharging points remote from each other, and the more compact rotary-hearth type with its charging and discharging doors close together. Both types have their own fields of usefulness according to the arrangement of the workshop and the flow of work through it.

The hearth of the rotary type of furnace is annular in plan and is usually carried on a circular cast-iron channel ring supported on a series of rollers mounted on the steel understructure. It is sand-sealed and driven by an electric motor operating through a reduction-gear unit and a speed-change box. The furnace can be arranged for either continuous or intermittent operation, usually with push-button control. The heating elements are mounted on the side walls and, sometimes, suspended from the roof. This type of furnace is particularly suitable for repetition work and is used for the continuous heat-treatment of gears, dies, stampings, aeroplane and motor-car engine parts and also for heating aluminium-alloy billets for stamping.

Straight-through Type

The straight-through furnace is nearly always specially designed for a particular duty and for handling a particular charge which is more or less uniform in its physical dimension and which calls for a uniform heating and cooling cycle without frequent change or adjustment. The two principal forms are the roller-hearth and the conveyor-belt. The former is used fairly extensively for annealing, normalising and heat-treatment of strip in straight lengths and for the heat-treatment of smaller, and often miscellaneous, parts which are carried on trays. The charge is usually carried through the furnace on driven rollers.

In some cases the charge is quenched on emerging from the furnace; in others there is a cooling zone through which the charge passes after it leaves the hot zone. A pre-heating zone can be introduced between the charging point and the hot zone. Thus, by careful design, correct proportioning of the different zones and adequate speed control, almost any desired heating and cooling programme can be carried out automatically. This, incidentally, can ensure a uniform product. Most of the above comments apply equally to the conveyor-belt furnace, but in this case the charge is carried through the furnace on a mesh or chain-link belt.

In between the stationary-batch and the continuous furnaces there is a number of other kinds of furnaces. There is, for instance, the pusher type, in which the charge is pushed a predetermined distance along the hearth at regular and fixed intervals. There is also the multi-car type, in which the introduction of a fresh car at the ingoing end pushes the leading car out of the furnace at the discharge end. Then there are the walking-beam furnaces of many different and ingenious designs. In these, progress along the hearth of the furnace is obtained by alternate sections or members which form the hearth and which are moved upwards and forwards mechanically.

Strip and Wire Annealing

Last, there are continuous strip and wire annealing furnaces, sometimes called catenary furnaces, in which one or more strips of metal or strands of wire are drawn through either a constant-temperature or a zoned furnace at a definite but adjustable speed by means of coiling gear at the discharge end, which works in conjunction with uncoiling gear with a suitable tensioning device at the ingoing end.

Many furnaces work with artificial gas atmospheres. The chief objects are bright annealing, clean hardening and normalising, gas carburising, nitriding, brazing and the reduction of oxides produced during a previous process. One point which should be stressed in this connection is that an artificial gas atmosphere can be introduced to and maintained in an electric furnace without interference from or contamination by products of combustion.

Reference should also be made to the electrode-type salt-bath furnace which is being used more and more extensively for the pre-heating, hardening and hot-quenching of high-speed steel tools, also for brazing tungsten-carbide tips on to medium carbon-steel shanks.

Sun Spots

THE sun-spot group that became visible to the naked eye between February 25th and March 1st this year had the most powerful magnetic field ever measured at the Mount Wilson Observatory, U.S.A., where photographs have been taken on every clear day for over a quarter of a century without revealing a greater value.

On two days the field reached 51,000 gauss, compared with an average of 3,000 gauss for most large sun spots. The recent group was also remarkable in that it contained magnetic fields of opposite polarity almost in contact, like the north and south poles of a horseshoe magnet, instead of being widely separated as is usually the case.

E.C.A. Notes

REFERRING to the instructions regarding the provision of new supplies and extensions of existing facilities circulated by the Electricity Commissioners to electricity supply authorities, the Director of the Electrical Contractors' Association (Mr. L. C. Penwill) says that the Commissioners suggest that in future before electrical contractors undertake wiring for such supplies they would be well advised to get into touch with the supply authority concerned to ascertain whether the required supply will be forthcoming.

Saving Rubber and Metal.—The Ministry of Supply draws the particular attention of electrical contractors to the need for conserving all types of scrap electric cable containing rubber. In the past it has been customary to sell scrap cable to scrap metal merchants who have burned the rubber to recover the metal. As the rubber used in cable manufacture is of high quality arrangements are being made to strip the cable and recover both the metal and the rubber.

Contractors are asked to do all in their power to assist in the salvage drive generally and particularly in respect of rubber cables.

The appeal issued by E.L.M.A. some time ago for the return of lamp caps to the makers is repeated by Mr. Penwill in a memorandum to his members.

Purchase Tax Increase.—It is pointed out by the Central Price Regulation Committee that the increase in purchase tax from 33⅓ to 66⅔ per cent. on certain price-regulated articles will not affect goods already in the hands of retailers. It is emphasised that it is an offence under the Goods and Services (Price Control) Act, 1941, to include extra purchase tax in the prices of such goods.

Country Allowance.—Under the National Working Rules men working on jobs which necessitate their lodging away from home are paid a "country allowance" of 3s. 6d. per night and provision is made for periodic returns to their homes. It has been stated by the E.T.U. that hardship is caused to the men by the exercise by the employer of his right not to pay country allowance for the nights the man is away. It was contended that as the demand for lodgings was greater than the supply the men had to pay for them whether they were used or not. The N.F.E.A. has agreed that for the duration of the war the allowance will cover the whole period of a job without deduction so long as the employee is absent with his employer's consent.

Extra Clothing Coupons.—Mr. Penwill says that several members have complained that men engaged in certain kinds of dirty work (*e.g.*, battery work) cannot keep themselves equipped with overalls as they lack the necessary coupons. Schemes of the Board of Trade enabling workers in certain industries to obtain supplementary coupons have so far not affected the electrical contracting industry.

He suggests that members should send him particulars of cases which seem to warrant the granting of extra coupons to enable him to approach the Department for some concession if there is sufficient evidence to warrant it. He points out that no concession will be granted to men working at benches or on ordinary installation work.

Registered Contractors

PROCEEDINGS at the annual meeting of the National Register of Electrical Installation Contractors held at the Institution of Electrical Engineers last Friday and presided over by Mr. P. V. Hunter, the chairman, were purely formal and lasted only about a quarter of an hour. In a statement read by Mr. A. Montgomery, secretary, on behalf of Mr. W. R. Rawlings, hon. treasurer, who was unable to be present, it was pointed out that for the second time in the history of the Register both income and expenditure showed decreases compared with the previous year. The saving in expenditure brought about by a reduction in all departments had helped to offset reduced income with the result that the final figures disclosed a net loss of only £276. The hon. secretary thought this was satisfactory, having regard to all the circumstances, and was a compliment to the management.

The Register was still financially strong, as it possessed more than £8,600 in liquid assets, and its investments had appreciated by some £250 in excess of the amount shown on the balance sheet. He thought that the course taken by the Executive Committee in bringing about a reduction in expenditure in 1942 would balance the reduction which might take place in income, and he believed that the loss would not exceed that for 1941. The report and accounts were approved unanimously.

As there were no new nominations for the Registration Board all members retiring in rotation were re-elected, as were also the retiring members of the Executive Committee, Messrs. P. V. Hunter, A. H. Dykes and D. B. Irving. Messrs. Hunter, Dykes and Rawlings were once again re-elected chairman, vice-chairman and hon. treasurer, respectively. It was decided to continue the donation of £10 10s. to both the Electrical Industries Benevolent Fund and the I.E.E. Benevolent Fund. The meeting closed with a vote of thanks to the chairman proposed by Mr. L. C. Penwill.

Another Salvage Competition

A SECOND national waste paper contest is starting to-day and will continue until the end of July. In the first competition last January £20,000 was awarded with three prizes of £500, £250 and £100 in each of twenty areas. This time the local authorities of England, Wales and Northern Ireland are divided into three classes—borough, urban district and rural district councils—and in each there will be a first prize of £1,000 and six others, making £2,500 in all for each class. Another £2,500 has been allocated to Scotland, so that the total prize money, given by public-spirited organisations, is £10,000. Application of the prizes is to be left to the entire discretion of the successful local authorities.

The competition judges are Sir Vyvyan Board, chairman of the Salvage and Recovery Board of the Ministry of Supply; Miss Megan Lloyd George, M.P.; and Mr. S. T. Garland, general manager of the Waste Paper Recovery Association, 154, Fleet Street, London, E.C.4 (tel.: Central 1345), from whom any further information needed can be obtained.

Transoceanic Telephony

Dr. O. E. Buckley's Kelvin Lecture

THE thirty-third annual Kelvin Lecture was delivered at the Institution of Electrical Engineers in London on April 23rd. It forecast the future of transoceanic telephony and had been prepared by Dr. Oliver E. Buckley (president of the Bell Telephone Laboratories, New York City) who was unable to deliver it in person as he had intended doing. Instead he sent a short talking cinema film of himself introducing the lecture, which was read for him by Col. Sir A. Stanley Angwin, engineer-in-chief of the G.P.O. and a vice-president of the I.E.E.

The lecture commenced with a review of the consequences of the extension of the frequencies utilised and proceeded to explore some of the future possibilities of further expansion of band width in transoceanic communication. Both radio and wire systems were taken into account to make the picture complete.

A Communication "Commodity"

Telephony was born from telegraphy by the expansion of the band of frequencies employed in the electrical transmission of intelligence. Twenty printing telegraph channels with adequate separation cost, in frequencies, about as much as one ordinary telephone channel; but for one television channel the price had to be paid, in frequencies, of 1,000 telephone channels, or 20,000 printing telegraph channels. Thus frequency band width had become almost a commodity to communication engineers.

The fastest loaded transatlantic cable had an effective frequency band of over 100 c/s and could carry four times as much telegraph traffic as a non-loaded cable of the same size and length. The longest deep-sea telephone cables stretched only 105 nautical miles from Key West to Havana; they were laid in 1921, but by 1928 cable structure and materials had progressed sufficiently to cause tests for a transatlantic cable to be seriously undertaken under practical conditions.

A 20-mile section of cable was made in 1930 under Bell supervision by the Norddeutsche Seekabelwerke at Nordenham in Germany. It was laid first 2·5 miles deep in the Bay of Biscay, then recovered and relaid in shallow water off the Irish coast. Simultaneously with the cable tests experiments were conducted with terminal apparatus in the New York laboratory. The method of operation was extreme as well as novel. The time required for speech to travel along such a cable (1,800 miles of artificial line) was about one-tenth of a second; a delay quite long enough to be noticed, but not serious enough to be counted a major disadvantage.

All the tests combined in proving the technical soundness of the proposal. The performance of the cable (its construction and loading with four layers of very thin perminvar tape were briefly described) would have been superior to that afforded by radio, but the cost would have been much greater—about $15 million. When the project was first considered the radio connection had been subject to frequent interruption so the cable was then regarded as an economically justified supplement. With the improvement of radio communication so expensive a cable to carry a single conversation could no longer be justified.

Meanwhile other prospects had materialised, but before examining them the lecturer estimated some of the future possibilities of radio-telephony, which was also characterised by the widening of its spectrum. Only a small portion of the utilisable range was, however, available for transoceanic communication. In the long-wave range for transatlantic distances radio was seriously limited in respect of high noise level (due to thunderstorms) as well as weakness of received signals during sunset and sunrise periods. More recent experiments had demonstrated the feasibility of transmitting two channels at different frequencies by means of the same equipment, which might ultimately lead to more economical provision of an additional long-wave circuit.

Disadvantages of Short Waves

In the case of the radio-telephony connection between the United States and England, according to present practice, the cost of short waves for an approximately comparable quality of service was about one-half that of long waves. Consequently by 1939 some 170 important long-distance short-wave telephone circuits had come into operation, of which five were in regular use between the United States and Europe, apart from the host of broadcasting channels. Certain disadvantages of short-wave transmission must nevertheless be reckoned with. The greatest by far was its susceptibility to complete, or partial, interruption due to sun-spot cycles.

Combination of long-wave and short-wave telephony across the Atlantic Ocean provided a service that was acceptable for general commercial use, though admittedly of somewhat variable quality. Complete interruption of short-wave service with inadequate long-wave service to fall back upon remained the most serious limitation. Neither reliability nor

quality was yet up to the standard of a well constructed wire line. As matters were to-day the short-wave bands, carefully used, could be made to carry a very substantially increased load. The long-wave band was much more restricted, yet it was the long waves that must be depended upon when the short waves failed.

The application of broad-band carrier methods to transoceanic radio telephony might be anticipated with some confidence. That system was the most significant of recent land-line developments. Over open wire lines, or pairs of lead-covered cables, twelve telephone bands spaced at 4,000 c/s intervals were commonly transmitted in a group occupying a total band width of 48,000 c/s. With coaxial conductors the band had been increased to two million cycles, providing frequency space for some 500 telephone channels, and it might be expanded still further.

Pioneer Systems

Commercial success had already been achieved with small numbers of channels in the Holland-East Indies and the United States-England single-sideband systems. More recently, by applying the negative feedback principle, Bell Laboratories had developed a short wave transmitting amplifier of 200 kW capable of dealing with twelve, or more, closely spaced telephone channels. The broad-band transatlantic radio telephone system of the future might be visualised as built up of successive groups of such twelve-channel blocks.

But public transatlantic telephony was not the only service requiring the important short waves. If it deserved about one-tenth of the total facilities in that band, it would mean an allotment of 400 kc/s, or 100 one-way telephone channels, yielding more than 50 two-way circuits. Thus short waves could provide physical facilities for a volume of telephone communication far beyond that now obtaining. Great growth of transatlantic telephone traffic could be anticipated with confidence, but in proportion as the demands for service grew, the closer would be the approach to realisation of the ultimate physical possibilities, so the more serious would become the threat of interruption by magnetic storms.

Those conclusions caused the lecturer to revert to deep-sea cables as auxiliaries to short-wave radio systems. But multi-channel telephone cables across the ocean would need intermediate repeaters, in order to avoid extremes in structural design. The repeater housings should, if possible, be incorporated within the cable structure and treated as part of the cable, underneath its armour, rather than as an appendage to it.

Containers already devised comprised a succession of pressure resisting steel rings of 1·5 in. diameter and 0·75 in. width. Over them was slid a succession of thinner steel rings of the same width, but so placed as to overlap the joints of the inner rings. That flexible assembly formed an articulated cylinder 7 ft. long, which was placed within an annealed copper tube with watertight seals at its ends, the details of which were of great importance. They were strictly hermetic seals, the conductors emerging through glass, with a plastic seal through which water vapour would diffuse extremely slowly in the event of failure of the glass seal. Joined to the copper cylinder and extending over the cable core for several feet was a tapered copper sheath that served to distribute bending strain and protect the conductor joint at the seal. Such containers had been tested at pressures considerably greater than would be encountered in a transatlantic cable. They had also been repeatedly bent round a 6-ft. drum without failure.

The repeater elements, joined by flexible connectors, were separately contained in plastic cylinders about 6 in. long, loosely fitting inside the steel ring housing. They would be energised with DC, conveyed through the telephone cable; an operating potential to earth of 2,000 V oppositely poled at the ends of the cable was assumed, on a constant-current basis so that fluctuations of earth potential would not cause variations of the current supplied. The repeater elements were designed to withstand the anticipated voltage to earth. Tests of cable core and joints over a long period of time had not revealed any observable change under that impressed voltage.

Thermionic Valve Design

A period of twenty years without replacement was aimed at; therefore by transmitting signals at relatively low level the space current of the repeater valves could be kept very small, minimising temperature, so that cathodes of relatively large surface area might be expected to last for a very long time. Thermionic valves of that design had been put on life test more than five years ago; as yet there was no evidence of their deterioration, while an assembled repeater had been subjected to mechanical tests in the laboratory.

The heating filaments of the repeater (amplifying) valves would be in series with the central cable conductor. The fall of potential through the heater filaments would provide the plate potential for the valves. Appropriate networks would compensate for variation of cable attenuation with frequency. Negative feedback would maintain a high degree of stability over a wide band of frequencies and minimise the effect of variation of valve characteristics. The amplification provided by a single valve could drop to one-tenth of its normal value with scarcely appreciable effect on the performance of the repeater.

The repeater being a one-way device, two-way conversation would be simpler with two cables (2,000 miles) between Newfoundland and Great Britain, but it was not inconceivable that a single cable might do. With each cable transmitting 48,000 c/s (assigning 4,000 c/s per channel) there would be room for twelve telephone circuits. For a small sacrifice of quality that number could be materially increased. The total cost per telephone circuit with twin cables would be comparable with that of prospective short-wave radio systems. A considerable increment of cable cost over that of radio would be justified by the better quality of speech and the very significant advantage of privacy, added to which was the value of the cable as a supplement to radio systems to guard against their failure. Indeed the reverse might in fact happen.

Statistical comparison indicated that not more than one-third, possibly one-twentieth, of the potential telephone demand had been realised. Thus in place of the five pre-war telephone circuits across the north Atlantic Ocean from 15 to 100 would be needed. Which figure would prove to be the better estimate would doubtless depend greatly upon cost, but the lecturer did not think he could fairly be accused of excessive optimism in predicting a demand for not less than 40 circuits in the reasonably near future. In estimating probable growth it might be a mistake to attach too much importance to cost of service.

Speed and reliability were, within limits, just as important. Any service important enough to justify so large a group of circuits as had been estimated would have to live up to a better standard of reliability than short-wave radio alone could do. It might not be necessary to wait for sufficient traffic to grow, or complete economic justification, because of the tremendous importance of ensuring privacy and continuity of service. What such cables waited on was technical development, which was fairly straightforward.

Nevertheless it was not intended to create the impression that the time had come to proceed with the installation of such cables. Speculative though the lecture was, perhaps audaciously bold in parts, Dr. Buckley endeavoured to stay within the realm of engineering fact. He did not count on products yet to be born from the inventor's fancy and was optimistic that the hazards of the project could be reduced to an acceptable degree.

INSTITUTION PROCEEDINGS

Hospital Electrical Services. Lighting and Eyesight.

SOME of the very numerous ways in which electricity is used in hospitals were discussed at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 20th.

Mr. C. Morgan Davies opened the debate by pointing out the marked influence that electricity had had upon hospital development and medical science, practically every branch of electrical engineering being called upon to make some contribution to the equipment. Special care needed to be exercised to ensure adequacy of supply, particularly at times of stress and commotion, so that an alternative source was essential. In many large hospitals there were demands for low-pressure steam and other forms of waste heat, which often made generation on site an economic proposition. Utilisation of the public mains was generally essential for X-ray and other special purposes; public mains or emergency generating plant might alternatively serve as the stand-by. Trickle-charged batteries were useful for emergency lighting in operating theatres, but inadequate for general essential services.

Electricity *in* Hospitals

Many special applications of lighting were described, including fluorescent lamps and discharge tubes for X-ray viewers, the safe lighting of film processing rooms and shadowless lighting in operating theatres. In addition to normal small and medium power, there were many special requirements for radio reception, internal communications, timekeeping, high-frequency and high-voltage engineering, electrolysis, welding and small furnaces, and a multitude of applications classed broadly as "electro-medical."

Developments in radiology were illustrated by lantern slides while other devices illustrated and described included the tomograph (special apparatus by means of which a radiograph of a layer of tissues of the human body may be obtained in which intervening shadows are excluded), X-ray apparatus for mass radiography by means of miniature films, the high-frequency spark cutter in the operating theatre, treatment in the ultra-short-wave condenser and inductance fields, and deep X-ray therapy units.

Methods of screening high-frequency appliances, the operation of cardiographs *via* lengthy leads, the elimination of static charges in operating theatres and condenser discharge

units for X-ray diagnosis provoked an animated discussion. One speaker asking whether hospitals in general were well equipped with modern electro-medical appliances, elicited the reply that owing to lack of funds many hospitals still lacked the most modern apparatus.

I.E.S. Meetings

SPEAKING in an unofficial capacity, the chief medical officer of the City of Birmingham Education Department, Dr. Mitchell, delivered an instructive lecture at the Midland Regional Centre of the ILLUMINATING ENGINEERING SOCIETY in Birmingham on April 17th in which he dealt at some length with the construction of the human eye and the functions of its various parts, with explanations of long and short sight and astigmatism.

Having stated that seeing was a partnership of vision and light, the lecturer proceeded to outline the correlation of these two factors. He especially emphasised the fact that the "yellow spot" was the site of greatest acuteness of vision, being capable of perception in very fine detail. To take full advantage of this feature, high values of illumination on the visual task were necessary, which emphasised the risk that tests of short duration might produce misleading results with respect to the efficiency of the eye at low values of illumination.

Dr. Mitchell then dealt with the capability of the eye to accommodate itself to environment, with particular reference to "black-out" conditions, and explained how peripheral vision was utilised in such circumstances.

A meeting of the Bath Group of the Society was held on April 7th when Mr. G. H. Wilson presented a paper entitled "Street Lighting, Past, Present and Future." Anodised aluminium was mentioned for future reflectors and it was possible that plastic materials might be developed for refracting light. For schemes which were not purely utilitarian, fluorescent lamps might be installed.

Engineers for the Forces

AT Newcastle-on-Tyne a Conferance of the INSTITUTION OF ELECTRICAL ENGINEERS and the INSTITUTION OF MECHANICAL ENGINEERS has been held to discuss the question of releasing engineers for the Forces and to make good their replacement in industry. Prof. C. J. Hawkes, chairman of the Institution of Mechanical Engineers was in the chair, supported by Mr. R. W. Gregory, chairman of the I.E.E. (North-Eastern Section). Speakers included Dr. A. P. M. Fleming, of the Metropolitan-Vickers Electrical Co., Ltd., Dr. Abbot and Mr. J. Fleming, of the Board of Education, and Mr. St. John Wilson, of the Ministry of Labour and National Service.

Choice of Control Gear

IN his presidential address to the BIRMINGHAM ELECTRIC CLUB Mr. J. W. Donovan, B.Sc., A.M.I.E.E., described how to choose and apply control gear for various power applications, especially machine tools. He showed the importance of selecting the right type of motor and control gear from the points of view of efficiency and output. Before the meeting, which was well attended, a reunion was held.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, May 7th, 6 p.m. Annual general meeting (Corporate Members and Associates only).

Wireless Section.—Wednesday, May 6th, 6 p.m. Discussion on "Post-war Planning in Radio Communication," to be opened by Col. Sir A. Stanley Angwin and Mr. H. Bishop.

Meter and Instrument Section.—Friday, May 8th. Holborn Restaurant, W.C.1. 1 p.m. Informal luncheon. 6 p.m. (at I.E.E.) paper on "Measurement on Impulse Voltages with a Ballistic Galvanometer."

Transmission Section.—Wednesday, May 13th, 6 p.m. Symposium of papers: on "The Manufacture and Testing of Oils and Oil-Resin Saturants for use in Electrical Equipment," by Messrs. A. W. Thompson and J. C. Wood-Mallock; "Insulating Oils for Cables," by Mr. S. Beckinsale; "Insulating Oil in Relation to Circuit-breaker Failures," by Mr. W. Fordham Cooper; "Mineral Oils for Transformers and Switchgear," by Mr. A. A. Pollitt; "Maintenance of Insulating Oils in the Field," by Mr. L. H. Welch.

Installations Section.—Thursday, May 14th, 6 p.m. "Electrically Equipped Single-Bucket Excavators," by Mr. P. H. R. Durand, B.Sc. (Eng.).

North-Western Centre.—Tuesday, May 5th, 6.30 p.m. Engineers' Club, Albert Square, Manchester. Dr. Fleming's paper: "A Critical Review of Education and Training for Engineers."

South Midland Students' Section.—Thursday, May 7th, 6.30 p.m. Loughborough College. "Short-Circuit Currents in AC High Power Systems," by Mr. J. C. Grant.

North Midland Students' Section.—Saturday, May 9th, 2.30 p.m. Hotel Metropole, King Street, Leeds. "Design and Construction of Substations," by Mr. C. E. Smith (Sheffield).

Association of Scientific Workers.—Friday and Saturday, May 1st and 2nd. London School of Hygiene and Tropical Medicine, W.C.1. Annual Council meeting.

Royal Society of Arts.—Monday, May 4th, 1.45 p.m. John Adam Street, Adelphi, W.C.2. Last of three Cantor lectures: "The Distribution of Electricity," by Mr. E. Ambrose.

Electrodepositors' Technical Society.—Tuesday, May 5th, 6 p.m. James Watt Memorial Institute, Birmingham. "Heavy Chrome Deposition," by Mr. E. A. Ollard.—Monday, May 11th, 5.30 p.m. Northampton Polytechnic, London, E.C.1. "Recent Developments in Metal Rectifiers as applied to Electrodeposition," by Mr. D. Ashby, B.Sc.

Institution of the Rubber Industry.—Wednesday, May 6th, 6 p.m. Empire Restaurant, Wilton Road, S.W.1. Informal dinner (price 4s.). 6.45 p.m. Annual meeting.

Junior Institution of Engineers.—Saturday, May 9th, 7 p.m. Engineers' Club, Manchester. "The Synchrophone as an Aid to Wartime Training," by Mr. N. Sandor.

Institute of Metals.—Wednesday, May 13th, 6 p.m. Institution of Mechanical Engineers, Storey's Gate, S.W.1. Lecture: "Water Power and its Application to the Production of Metals," by Mr. W. T. Halcrow, M.Inst.C.E.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT last Thursday's meeting of the I.E.E. the President, Sir Noel Ashbridge, presented to **General A. G. L. McNaughton,** the vellum certificate of honorary membership of the Institution after referring to General McNaughton's distinguished scientific and military career. Later Sir Noel handed to Mr. Constantine Zinchenk, First Secretary of the Russian Embassy the Faraday Medal awarded to **Dr. P. Kapitza,** who, owing to his work in Russia, was unable to be present in person.

The G.E.C. Dramatic Society, whose activities have, unfortunately, been almost suspended during the war, recently gave an excellent performance of the comedy "George and Margaret." The members of this Society had reached a very high standard when war intervened and it is encouraging to know that they still have at call such talented players as the Misses I. Herod, C. Needham and C. Ridler and Mr. W. J. Peacock,

A scene from the G.E.C. Dramatic Society's production of "George and Margaret"

as well as a number of keen and promising newcomers. The Society is maintaining its tradition of giving the proceeds to charitable causes and on this occasion the fund sponsored by the Hon. Mrs. Gamage for sending newsreels to our troops in Iceland received a cheque for £110.

Mr. G. H. Wilson has been elected chairman and managing director of Laurence, Scott & Electromotors, Ltd., in succession to Capt. G. J. Scott, who died at the end of March. Mr. Wilson, who joined the company in 1919 after leaving the Royal Navy, in which he served during the last war, has been a member of the board since 1922. **Mr. E. Pinckston** and **Mr. F. Lee** have been appointed to the board. Both have held executive posts in the company's organisation for many years, the former as Midlands manager, and the latter as general manager of the Manchester works. **Mr. A. Tedcastle,** A.S.A.A., formerly assistant secretary, has been appointed secretary.

We regret to learn that **Major Eric Beaver,** Royal Corps of Signals (11th Indian Divisional Signals), son of Mr. A. G. Beaver, managing director of the Sun Electrical Co., Ltd., is reported missing after the Malayan operations. Any information will be gratefully received by his wife at 11, Greenhill Avenue, Shrewsbury.

Mr. H. Pryce-Jones, M.Eng., has been elected chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers for 1942-43.

Mr. H. W. Green, M.I.E.E., has been elected chairman of the North-Eastern Centre of the Institution of Electrical Engineers for the 1942–1943 session. Mr. Green is assistant electrical engineer, North-Eastern Area, of the L.N.E.R.

Appreciation of the services rendered by **Mr. W. R. Elliott,** engineer and manager to the East Ham Corporation, **Mr. A. C. Harvey,** deputy engineer and manager, and **Mr. H. M. Patten,** assistant engineer, each of whom will have completed forty years in the Electricity Department before the end of this year, was expressed by Alderman Newling, chairman of the Electricity Committee, at a recent meeting of the Town Council. The question of their retention in the Council's service as temporary officers is to be considered at the next meeting.

Mr. A. E. Iliffe (Benjamin Electric, Ltd.) has been re-elected chairman of the Electric Light Fittings Association for the current year.

At a meeting of the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-on-Tyne on April 24th **Mr. Ramsay Gebbie** (managing director, W. Doxford & Sons) was elected president for 1942-43.

Obituary

Mr. Septimus Gillatt.—We regret to record the death of Mr. Septimus Gillatt, a director of Ozonair, Ltd., since its formation in 1913 and chairman since 1918, and also a director of the Sloan Electrical Co., Ltd.

Mr. A. T. Crowe, assistant sales manager of W. T. Henley's Telegraph Works Co., Ltd., died on April 22nd, aged fifty-two. Before entering Henley's service Mr. Crowe had gained wide experience in the electrical industry, first in the workshops of Johnson & Phillips, Ltd., and later with British Insulated Cables, Ltd. He joined Henley's in 1912, and after the last

war became chief assistant to the late Mr. Nichols, on whose death, nearly eight years ago, he assumed the title of assistant sales manager in charge of the sales engineering department.

Mr. J. Edmunds.—We regret to announce the death on April 17th, at the early age of forty-four, of Mr. John Edmunds, assistant to the works manager at the Gravesend works of W. T. Henley's Telegraph Works Co., Ltd. Mr. Edmunds, who joined Henley's in September, 1919, as a progress clerk, was appointed works accountant in November, 1936, and assistant to the works manager in June, 1941.

Mr. Arthur Turner, well known in the Scottish electrical trade, has died in Stirling Royal Infirmary as the result of injuries received when he was knocked down by an Army motor cycle. Mr. Turner, who was sixty-nine years of age, had been for forty years with the British Thomson-Houston Co., Ltd. For over thirty years he had been district engineer to the company's electrical construction department.

Mr. Alfred Howell, whose death is reported in *Electrical News and Engineering* (Toronto) assisted in the completion of the transatlantic telegraph cable after the first and second attempts had failed. Mr. Howell, who was eighty-five, was probably the last link with the early days of electrical communication between Europe and the New World. He was born in the Isle of Wight and at the age of fourteen started work in the testing department of the Telegraph Construction and Maintenance Co., of Greenwich, becoming intimately acquainted with telegraphic communication generally and submarine telegraph cables in particular. He went to Canada in 1883 and joined the manufacturing department staff of the Bell Telephone Co., which had been formed the previous year, and which later became the Northern Electric Co., Ltd.

Mr. W. E. Haines.—The death at Toronto is recorded of Mr. William Ernest Haines, who was for many years engaged in scientific research work in Canada. He was born at Cheltenham, Gloucestershire, and went to Canada in 1912. Besides his extensive work in the electrical field, he did scientific research work for the University of Toronto for some years.

Mr. L. Murphy.—The death occurred suddenly on April 23rd of Mr. Leonard Murphy, of Nelco., Ltd., Shalford, Surrey.

Mr. James J. Atkinson, who died on April 13th, was a director of British Electrical Repairs, Ltd., and the British Engine, Boiler & Electrical Insurance Co., Ltd.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

"State Salary Required"

I HAVE recently answered one or two advertisements in the ELECTRICAL REVIEW, but without result. In each case the advertiser has specified "state salary required"; in this week's issue there are nine situations vacant and in six of them the same request is made.

This is very unsatisfactory from the point of view of whoever may think of applying for the vacant posts and I wonder if you could possibly represent to advertisers the desirability of putting it the other way about and stating what salary they are prepared to offer. As it stands it would appear that the cheapest offer is going to receive the most favourable consideration. I do not think that this is really the case but it looks like it.

Take my own case: I am a mechanical and electrical engineer, with a good training in technical accounts and some forty years' experience. My last salary was between £900 and £1,000 per annum. Now I am anxious to do my bit and I am looking for some employment. I don't expect to be able ever again to obtain the same salary, but it is very difficult to fix a figure to ask. If I ask for £500 or £600 it might be considered too much, on the other hand if I asked for say £200 or £250 I should expect a firm to say, "Well, this man does not place a very high value on his services; he cannot be much good."

Nearly all advertisers ask for replies to a box number, so that any one answering has no means of knowing to whom his application is addressed, and cannot gauge the importance of the firm, nor yet have any idea as to the duties he will be expected to perform. Thus he is absolutely in the dark, but the advertiser knows all these things and the salary he is prepared to pay. Then if it is considered to be inadequate or is less than one expects one does not answer, and neither side is any the worse off.

If you can influence advertisers, I am sure you will earn the thanks not only of myself, but of all who come to answer these advertisements.

Putney, April 21st. C. W. HASTWELL.

Significance of "j"

NO doubt, the definition of "j" as the square root of minus one, while correct, is almost meaningless to an electrical engineer's mind. A. G. Powell, in your issue of December 19th, 1941, has given one definition which is more suitable to an electrical engineer. According to him, "j" is the unit vector in the positive imaginary axis of a cartesian (rectangular) co-ordinate system, much the same way as "1" is the unit

vector in the positive real axis. This explanation is useful for all numerical work in the complex plane which requires a co-ordinate system for reference.

However, there are many cases in electrical engineering in which one is solely interested in the relative position of vectors, and dispenses with any co-ordinate system. One draws a voltage vector, shows that the current produced by this voltage is lagging, that the drops produced by this current have certain relative positions, and so on. Coming down to numerical work, one vector—sending voltage, receiving voltage, or any other one—is customarily drawn coincident with the real axis of a cartesian co-ordinate system, but this is a matter of convenience and not of principle.

If such co-ordinate-less vector positions are represented, "j" is defined as the turner, or versor, of amount one turning a given vector by 90 degrees (counterclockwise).

Both definitions are, of course, consistent with each other and with the square root of minus one, but have the advantage that they can be visualised as concrete, geometric quantities, devoid of any abstract symbolism.

LUDWIG F. ROEHMANN.

New York, U.S.A.

Incendiary Bomb Detection

MR. HAWKINS'S letter in your issue of April 17th about my article on an incendiary bomb detector raises a very interesting point with respect to the operation of the alarm on impact of objects other than incendiary bombs. This point was investigated very carefully during the original experimental work which was carried out about the time the night raids started in 1940. The final conclusion arrived at was that it was of advantage to know when bodies of the size of an incendiary bomb hit the roof, *e.g.*, certain devices used in anti-aircraft defence, spent shells, large pieces of shrapnel, concrete, etc., but the alarm was not required to be operated by gunfire, planes, small objects, etc.

The alarm described has fulfilled these requirements in practice except in one respect, that is, it is operated when an H.E. bomb explodes nearby. This has actually happened a number of times, but the cause is so obvious that the fire-watching parties immediately know what caused the operation of the alarm, and it can at once be reset. It should be noted that the alarm is arranged to give warning to the fire-watching party and is not intended to call out the national fire fighting services; this was emphasised in the last few lines of the article.

As Mr. Hawkins mentions, it would perhaps be more strictly accurate to describe the device as an impact detector but since the primary object is the detection of incendiary bombs it was thought that the title chosen was more appropriate.

As regards the remarks about BS/ARP.60, this specification was not published at the time the experimental work was done, but the principles were quite familiar and the methods described were carefully investigated. The method of detection by the light given off by an incendiary bomb was not used chiefly for the following reasons:—

(*a*) In order to make the alarm insensitive to daylight a circuit requiring continuously operating high-tension batteries is required (connections to the mains was never considered for obvious reasons).

(*b*) It is difficult, in practice, to make it insensitive to the switching on of an electric light in a room containing a photo cell; this must be taken into account since incendiary bombs often pierce the ceiling and burn in the room below.

(*c*) In order to cover a building efficiently a large number of cells is required.

(*d*) It is not so easy to test effectively as is an impact detector; ease and efficiency of testing were considered to be of first importance.

(*e*) Detection by impact gives a somewhat earlier indication than by photo cell.

Gravesend. EDWARD BURKE.

Parliamentary News

Utility Wireless Sets

MR. Woodburn asked the President of the Board of Trade whether consideration had been given to the production of a utility wireless set, with standardised components and fittings to get the maximum supply with the minimum of labour and material.

Mr. Dalton replied that some 125,000 wireless sets for the civilian population were in process of manufacture. The quickest and most economical results would be achieved by completing those sets rather than by embarking at that stage on the production of a utility wireless set. This, however, was under consideration for the future.

Shortage of Radio Valves

Sir William Davison recently asked the President of the Board of Trade whether he was aware of the shortage of wireless valves, chiefly rectifier valves, which was holding up the repair of thousands of wireless sets often for many months; and, having regard to the desirability of the public having their wireless sets in working order so that they might hear the frequent public announcements made by wireless, whether immediate steps would be taken to release as large a number as possible of these valves to enable the necessary repairs now being held up to be carried out.

Captain Waterhouse said that the increasing use of radio by the Services had resulted in a very heavy demand for valves. The capacity of the valve industry was being increased as quickly as possible and steps had been taken to obtain supplies from the U.S.A. Rectifier valves presented special difficulties, but it was hoped to increase the supply of these in the near future.

Fuel Rationing

Details of the Beveridge Plan

SPECULATION regarding the nature of the much-debated fuel rationing scheme has been set at rest by the publication of the report by Sir William Beveridge. He claims that the scheme which he proposes is the only possible way of attempting fuel rationing successfully.

The introduction to the report deals with the special difficulties encountered. Such a scheme, in order to be equitable, must cover practically all fuels in general use, whereas important foodstuffs remain unrationed. The ration must be adjusted to individual needs and based primarily on households whose requirements vary considerably. While solid fuel is bought in advance the consumption of gas and electricity cannot be determined until some time afterwards. Coupons must be used, but unlike those in use for other purposes, must be collected by agents not under the direct supervision of the suppliers. Effective control of traders in meeting domestic needs is difficult or impossible without equal control over industrial supplies.

For all these reasons fuel rationing presents materially greater difficulties than food rationing and cannot be expected to work so smoothly. While Sir William is satisfied that the difficulties can be overcome, they must be faced before a decision to ration is made.

Numbers and Quality of Staff

The problem of staff is serious. He estimates that the number of temporary clerks required for the issue of ration books may be of the order of 15,000, distributed between about 1,500 local fuel offices. The number may be less, but no close estimate can yet be made. These clerks are likely to be required for six weeks or two months; after that a small proportion should suffice for current administration, but the question of numbers is less difficult than that of quality.

The foregoing estimate of numbers refers only to the staff of the Rationing Department. The scheme has been devised to place a minimum of additional duties upon suppliers, but some additional work in collecting coupons and adjusting supplies is inevitable. It is suggested that the combination of gas and electricity meter readings might ease this burden.

The scheme has been discussed with representatives of the industries concerned and consumers' organisations. The latter agreed that the scheme accorded in its main principles with their views. The suppliers' representatives, while anxious to avoid rationing and emphasising its difficulties, also expressed their readiness to co-operate should rationing be decided upon. There was some division of opinion regarding the main principles of the scheme in the case of gas and electricity. Consultations have also taken place with local fuel overseers.

It is estimated that a 12½ per cent. cut in domestic consumption—which should not cause serious hardship—would save 10 million tons of coal a year. The poorest consumers should receive at least as much as they have received this winter.

Even if rationing is practicable, as Sir William believes it is, it may still be asked whether the saving aimed at could not be met better and more cheaply by increasing production and appealing for economy.

Summing up, Sir William says that only rationing can secure equitable distribution; additions to consumers' purchasing power are inevitably directed towards increased consumption of unrationed articles; that a greater cut might be necessary later on, so that it is prudent to introduce a mild rationing scheme; and the public prefers fair compulsion and rejects appeals. There are four main conditions of success:—An immediate decision, to allow ration books to be ready and staffs trained before the rise of consumption in September; the setting up of the necessary department of the Board of Trade to administer the scheme; the immediate safeguarding of fuel suppliers against further depletion of their staffs and equipment; and the giving to supplies of domestic coal a priority second only to that of operational requirements.

Outline of Scheme

Rationing will cover the consumption of coal, coke, gas, electricity, paraffin and artificial fuels mainly composed of coal or coke. In addition to domestic premises the scheme will cover all residential establishments, including hospitals and hotels, and non-residential establishments such as day schools, churches, business offices, shops, restaurants and places of entertainment.

There will be both a household ration and a personal ration. The former will be fixed for each household by an assessment of needs on the rationing period and not by reference to a datum period. The personal ration will be a uniform allowance for each individual to be used in the household in which at any time he finds himself. A "points" system will be employed by which each household will receive a certain number of coupons to be used for any of the rationed fuels during the rationing period. Each householder will receive, it is hoped during the first half of

August, a ration book with a number of coupons for a year's fuel consumption as assessed by the Fuel Office for the household on the basis of the facts set out in a form to be filled in by the householder. The coupons will represent units of fuel, each unit being one cwt. of coal or its equivalent. It is noted that the exchange values commonly suggested are that one cwt. of coal should be treated as equivalent to five therms of gas and 90 kWh, but these figures should be the subject of further examination. Each person entitled to clothing coupons will receive before June 1st a clothing ration book with a sheet of coupons to be used for obtaining fuel. Each coupon will be valid for ½ cwt. of coal or its equivalent. It is suggested provisionally that the number of coupons should be 15, giving a personal ration of 7½ cwt. of coal a year or its equivalent. Persons over 65 or invalids will be allowed to use some of their ordinary clothing coupons for fuel.

Coupons for gas and electricity will be collected by the meter reader and "any householder who fails to deliver coupons as required will in addition to the other penalties for unauthorised consumption under the Defence of the Realm Regulations, be liable to have his supplies cut off. Even if supplies are not cut off at once, excess consumption in the first rationing period will reduce the allowance in a later period."

Though the ration books will not be issued until August it is proposed that rationing of coal and coke shall begin from June 1st, and of gas and electricity at the first meter reading after August 15th, when coupons will be collected for the period covered. Thus in most cases rationing will begin to apply during May or June.

It is suggested in the report that an educational campaign to instruct consumers in fuel economy should be conducted. In determining the household fuel ration consideration will be paid to special circumstances *e.g.*, locality, number of rooms occupied, etc.

In addition to the collection of coupons, suppliers of gas and electricity will be required to cut off supplies if so instructed by the Fuel Office and "to report to the Fuel Office after each quarterly inspection any householder whose consumption in that quarter has been so high as to suggest that he is in danger of exceeding the ration before the year is out, so that a warning may be sent to him."

Questions in Parliament

CONSIDERABLE apprehension regarding the proposed fuel rationing scheme was evinced in the House of Commons following the statement last week by Mr. Dalton, President of the Board of Trade.

In reply to a question by Sir Percy Harris whether an opportunity would be given, when the scheme is ready, for a full debate, Mr. Dalton said that this would undoubtedly be considered through the usual channels.

Sir William Davison asked if any estimate was being prepared of the cost of the thousands of officials who would be required? Mr. Dalton replied that estimates were being prepared of all relevant factors. It was a difficult and necessary operation to reduce the consumption of fuel.

Mr. Shinwell suggested that it would be an advantage to have a discussion on the matter on the adjournment before the Board of Trade settled the details of the scheme finally. He was not suggesting that Mr. Dalton was not capable of preparing a satisfactory scheme, but as this was a very complicated matter, it might be an advantage to him to hear the views of members before the scheme was finally decided.

Mr. Buchanan asked if Sir William Beveridge's report could not be made available and the House know what kind of evidence he had and what kind of people he interviewed. Sir William was a great man, but after all he was not the greatest. The collective wisdom of the House should be taken into account.

Mr. Dalton stated that Sir William had submitted a report which was very valuable, but it was not being swallowed whole without very careful consideration, and at that moment the details of the scheme were being worked out.

Wing Commander James asked what percentage increase in coal output would be necessary to obviate the need for this very complicated scheme. Mr. Dalton replied that that was an arithmetical question he could not answer then, but it was important both to reduce consumption and increase output.

In reply to Mr. Buchanan, Mr. Dalton said he would certainly undertake to consider whether or not the report of Sir William Beveridge should be published. As to the interests that were being consulted, coal merchants, gas and electricity distributors, the representatives of certain women's organisations, and certain others had been consulted. He had already said that consultation with interests affected was intended to be pursued before the detailed scheme was put down.

Members' Motion

Last week Sir Stafford Cripps, Leader of the House, answering further questions, said that the Government would give an early opportunity for debating the proposals.

Members, headed by Sir John Wardlaw-Milne, who is chairman of the Select Committee on National Expenditure, have put down a motion to the effect that in view of the difficulties of operating a scheme for the rationing of domestic supplies of electricity and gas, steps should be taken to release men temporarily from the Army and other methods adopted to increase coal output. Among the supporters of the motion are Sir Arnold Gridley, who was Controller of Electric Power during the last war and is now a director of a number of electricity supply companies, and Sir Herbert Williams, executive director of the Incorporated Association of Electric Power Companies.

COMMERCE and INDUSTRY

Lighting Fittings Industry. A.E.G. Profits.

Switchboard Attendants' Grading

Representations were recently made by the Electrical Power Engineers' Association to the Fulham Electricity Committee regarding the position of assistant switchboard attendants who, the Association claimed, should not be on the hourly-paid staff. The Committee finds that in similar undertakings these men are graded under the National Joint Board Schedule and recommends that in the case of Fulham the assistant switchboard attendants should be designated "auxiliary control engineers" and placed in Grade 10b of the Schedule. It is also proposed to re-designate, without change of grade, auxiliary control assistants as "auxiliary control engineers."

Hackney Engineer's Salary

The Hackney Borough Council Establishment Committee recommends the adoption of the salary scale approved by the National Joint Committee of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry, reserving the option of the Council contained in Clause 10 of the agreement to pay a reduced salary for two years upon a vacancy occurring.

War Damage Scheme Amendment

The War Damage (Amendment) Bill was given its formal first reading in the House of Commons last week. This Bill amends the War Damage Act, 1941, and Part II and Section 16 of the War Risks Insurance Act, 1939, but does not cover the position of public utility companies since discussions regarding war damage are still proceeding between them and the Government.

E.L.F.A. Annual Report

During the past year the work of the Electric Light Fittings Association has again been devoted mainly to the industrial and commercial branch. Reference is made in the Association's report to the work of the National Industrial Electric Lighting Service in which E.L.F.A. is strongly represented.

While it was found necessary to raise prices, the increases have been kept to the bare minimum found to be essential. Cordial relationships with the relevant Government Departments have been maintained. The Association now receives bulk allocations of steel and cast-iron for the manufacture of essential industrial fittings and issues sub-licences both to members and non-members; since the close of the year similar arrangements have been made for an allocation of non-ferrous metals.

Negotiations with the Board of Trade have resulted in an arrangement by which a manufacturer who has exhausted his quota under the Limitation of Supplies Order may apply for a special licence to supply commercial fittings essential to the war effort. In response to representations by the Association, the Customs and Excise authorities have agreed that purchase tax on chargeable fittings shall be a straight and constant percentage of the list price instead of 33⅓ per cent. of the invoice value. Special arrangements have been made to meet the cases of members who allow lower basis discounts than 33⅓ per cent.

Reference is made to alterations in the Fittings and Fittings Accessories Schedules of the Electrical Fair Trading Policy; to the E.L.F.A. Trading Codes; and to the E.L.F.A./E.W.F. register of approved fittings wholesalers.

Export of Clock Movements

Under the Export of Goods (Control) (No. 15) Order (S.R. & O. 1942, No. 578) made by the Board of Trade, licences will be required, as from April 21st, to export clock movements (including electrical clock movements), whether or not fitted with drums, discs or other attachments, of the kind used in recording instruments.

Factory Lighting

One of the most practical handbooks on illumination now available is "Modern Factory Lighting (including Special Wartime Requirements)" issued jointly by the British Electrical Development Association and the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2. Thousands of industrialists have had copies and must have derived much useful information which has been translated into practice. The book first appeared early in 1940 and two further impressions were issued in the same year. Now a fourth (revised) impression has been published and is obtainable by those concerned with industrial lighting from the above address.

The A.E.G.'s Report

The Allgemeine Elektricitäts Gesellschaft reports that for the year ended September 30th last, the net profit was about Rm. 10,000,000, compared with Rm. 7,650,000 the previous year. It is again proposed to pay a dividend of 6 per cent. A proposal to reduce the share capital from Rm. 260,000,000 to Rm. 220,000,000 by the redemption of some of the shares is to be considered at the general meeting to be held on May 20th. The development of business in the current year is stated to be satisfactory. The 6 per cent. dividend for the previous year was paid on a capital of Rm. 120,000,000.—*Reuter's Trade Service.*

Foremanship and Supervision

A large gathering attended the inaugural meeting of the Foremen's and Supervisors' Discussion Circle at the South West Essex Technical College on April 21st. A good many firms in this district were represented. The subject for the evening was "The Role of the Foreman in the Management of Production," and the speaker was Mr. E. F. L. Brech, B.A., B.Sc. Others present included Mr. McFarland Davis, registrar and general secretary of the Institute of Industrial Administration, and Mr. A. J. D. Hampton, chairman of the London Branch of the Institute. At the conclusion of

the address, the following officers were elected:—Mr. A. P. Warne, chairman; Mr. W. S. J. Fisher, vice-chairman; and Mr. W. E. West, hon. secretary. Committee members:—Miss O'Dell and Messrs. D. Diss, Hignett, F. Crawford, R. Atkinson and A. P. Paris. The next meeting will be held on May 19th at 7 p.m. in the College, when suggested points for discussion will be debated.

Registration for Employment

Particulars of the new Appointments Department of the Ministry of Labour and National Service have now been published. The purpose of the Department is to take over the Central and Supplementary Registers. Enrolment in the Central Register is confined to technical and scientific personnel and it will be operated in London. The Supplementary Register, which deals with men and women without specific technical attainments normally receiving salaries of more than £420 a year, will be administered by about thirty branches throughout the country.

It is proposed to keep the Registers up to date by direct reference to the persons concerned at two-monthly intervals. At present there are said to be about 15,000 people on the Supplementary Register and personal interviews with these are being arranged. The Appointments Department intends to work in close co-operation with the Man-Power Boards and will endeavour to provide suitable substitutes for men called to the Services.

It is hoped that the new Department will not only meet a wartime need but will provide a valuable agency for re-settling men and women in the post-war period. The address of the Department is to be Sardinia Street, Kingsway, London, W.C.2.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that the cost of living figure on April 1st (99 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in May.

Canadian and U.S. Standards

The British Standards Institution announces that the following Canadian and United States standards have recently been received and may be inspected at, or obtained on loan from, the offices of the B.S.I., 28, Victoria Street, London, S.W.1.

Canada (the standards in each case relate to the construction and testing of the equipment specified and the reference number is preceded by C.22.2):—Service-entrance and branch-circuit breakers (2nd edition, No. 5-1942); electric fixtures (2nd edition, No. 9-1941); fractional horsepower motors for other than hazardous locations (2nd edition), No. 11-1942); cord sets (2nd edition, No. 21-1941); integral-horsepower electric motors for other than hazardous locations (1st edition, No. 54-1942); snap switches (1st edition, No. 55-1942); specialty transformers (1st edition, No. 66-1942); portable electric vacuum cleaners (1st edition, No. 67-1942); motor-operated appliances, domestic and commercial (fractional horsepowers) (1st edition, No. 68-1942); electrically equipped machine tools (1st edition, No. 73-1941).

United States: Wet tests (A.I.E.E. No. 29-1941); capacitance potential devices and outdoor coupling capacitors (proposed, A.I.E.E. No. 31-1941); American Institute of Electrical Engineers proposed test code for single-phase motors (A.I.E.E. No. 502-1941).

Limitation of Supplies in Canada

The Canadian Government has continued its restrictions on the manufacture of non-essential goods and included among them further electric household appliances. The types prohibited for manufacture at the end of last year were broilers, food mixers, sandwich toasters, roasters, grills and waffle irons.

As from January 31st a ban was placed on the manufacture of percolators and tea kettles, but wholesalers and retailers were given permission to sell their stocks. This year and during the war makers of electric irons, toasters and household fans will not be permitted to turn out more than half the number of each of these appliances that they made in 1940. Makers have been called upon to furnish a statement of the number so made, the sale revenue and the number in stock. Parts for the repair of existing electrical appliances, as well as appliances for Government orders, are specifically exempt from such control.

The total value of Canadian manufacture of electric stoves, ranges and hot plates is now approximately $3,000,000, rather more than a third of which normally goes abroad. Imports of such goods are negligible.

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following. Objections may be entered within a month of April 22nd:—

TELOSIG. No. B616721, Class 9. Electrical control apparatus for signalling systems.—Telesignal Electrical Co., Ltd., 3, The Pantiles, Elmers End Road, Beckenham, Kent.

Design No. B616544, Class 9. Electric cables, wire and insulated conductors. Also No. B617545, Class 17. Electrical insulation material and insulation parts.—Duratube & Wire, Ltd., 16, Hanworth Road, Feltham, Middlesex.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

Miniature spiral heating element for electrical gas lighter.

Unusual Compensation Case

Extension of Employers' Liability

By F. E. Sugden, A.C.I.S., Barrister-at-Law

IN spite of all precautions accidents will happen and, as a consequence, the electrical manufacturer or contractor must carefully study the Workmen's Compensation Acts, 1925-1931. But even then there are pitfalls. Sometimes the employer considers that an employee who returns to his work after an accident has recovered, and he is entitled to ask the employee to submit to a medical examination. Such an examination can only be refused if the employee can show that it is not for his benefit.

In practice there have been many cases of variation of awards where, rightly or wrongly, the employer has felt that the employee can either return to work or perform work of a lighter nature in order to reduce the amount of compensation. It is necessary to bear these points in mind when considering the case of Redpath Brown & Co., Ltd. *v.* Hayes, which went before the Court of Appeal recently on the appeal of an employee from the decision of a County Court judge and is the first case of this kind.

Points at Issue

Briefly the facts of the case were these: A workman met with an accident in 1938 as a result of which a part of the bone-work of his foot was badly crushed and had to be removed. As a consequence he was unable to walk more than about two miles with the aid of a stick. The employer made him a weekly payment in the way of compensation.

In 1941 a surgeon examined the workman on behalf of the employer and advised him to have his foot amputated. The employee refused and thereupon the employers applied to the Court for termination of their weekly payments on the grounds that the employee had refused to undergo a surgical operation of a reasonable nature. The employee consulted another surgeon who advised him not to have his foot amputated. The employer had made no definite offer to provide him with an artificial limb.

The Court held that the question to be considered was not whether the proposed operation was reasonable or not, but whether the workman was unreasonable in refusing to undergo it, which, of course, was a totally different story. The Court decided that there was no evidence to show that the refusal was unreasonable, particularly in view of the fact that no offer was made to supply the man with an artificial limb and to replace it when it was worn out or damaged.

This case is important because it shows the position of the employee in reference to the refusal of medical treatment. An employee cannot refuse to have an operation if it is proved to be for his benefit and, if he adopts an unreasonable attitude, his compensation can be stopped. If the employee is acting on medical advice in his refusal his attitude is justified. But this case takes the matter a step further. The Court appeared to rule that if the employee had a limb amputated the employer must make provision for an artificial one so that as far as possible he could resume his normal course of life.

It seems to me that the decision makes it necessary for an employer to scrutinise his employees very carefully to see that they are free from disabilities which might be aggravated by an accident and result in the removal of a limb. It may even necessitate having employees medically examined where there appears to be a doubt regarding their physical capacity in case there is a hidden liability which might be saddled upon the employer.

Variation of Payments

While I am dealing with this case I would like to give electrical employers additional advice regarding the variation of compensation claims. Most of them take out a policy of insurance, but if they have too many claims the insurance company will increase the premiums. Hence the necessity of care in dealing with these claims. If an employee has met with an inevitable accident and has been on the sick-list some considerable time the employer should communicate with the insurance company, which will authorise him to consult a specified medical man and ask for the employee's examination; upon the doctor's report the company will issue instructions.

However much the employer is inclined to feel that the employee is malingering, he should not stop the compensation allowance or dismiss the man, but await the medical report. He should also give full opportunity for the employee's medical adviser to be present at the examination, so that there is no risk that the employee will claim that he has not received full consideration. There has been more difficulty under the Workmen's Compensation Acts regarding the variation of awards than any other part of the Acts, hence the necessity for carefulness.

On-Load Tap Changer

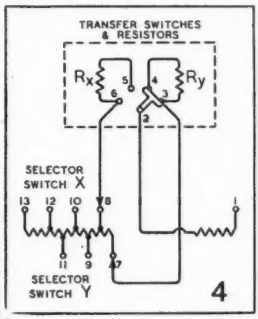
High-voltage Type for "Fully Insulated" Transformers

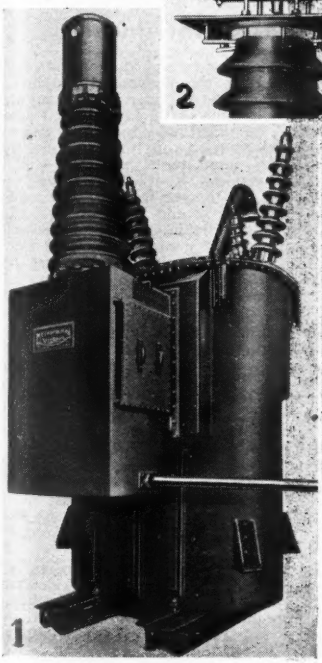
CONTINUING its already wide range of on-load tap changing equipment for transformers the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17, has developed a high-voltage type suitable for use with "fully insulated" windings, the tap changer being capable of withstanding the full transformer test voltage of 1 kV, plus twice the service voltage. This type LP is designed for service at up to 132 kV with a maximum test to earth of 265 kV, which is believed to be the highest voltage design yet produced in this country and, so far as is known, it has not been exceeded in any other country.

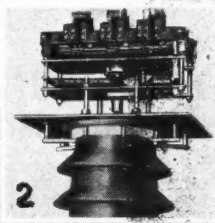
This class of tap changer has not been required for British operating conditions, but in the British Dominions and elsewhere abroad it is needed for 110- and 132-kV systems with unearthed neutrals and, moreover, when the neutral is earthed through an arc-suppression coil the changer has to withstand the increased voltage stresses to earth.

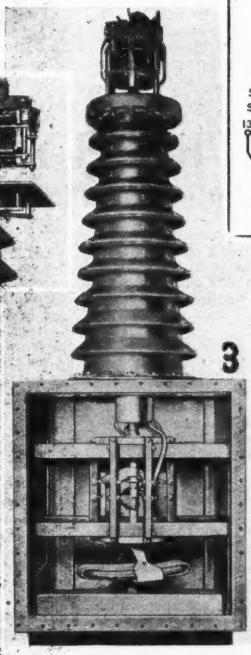
To adapt existing ironclad designs by increasing clearances would have involved excessive bulk and large oil content. Instead the transfer switches and preventive resistances are mounted in a separate chamber insulated from earth by a porcelain bushing, through which the shaft runs down to the oil-immersed tap selector switches and, furthermore, the centre tapped reactor of former designs has been replaced by resistors that are easily accommodated with the transfer switches in the chamber which is insulated by the porcelain bushing, and which has the same insulation strength as the line bushings. One of the phase transfer switches and two resistors are mounted on the bushing which stands on the tank containing the tap selector switches. The whole unit is attached to one tank of a bank of three 10,000-kVA, single-phase transformers stepping down from 110 kV delta to 22 kV star, with ten steps of 2 per cent., in this case insulated for a test of 221 kV to earth.

To suit local conditions for coupling the three tap changers, they are mounted on the low-voltage side of their respective transformer tanks, in this instance. To keep the preventive resistors to reasonable dimensions, they have to be short rated. Therefore they are short-circuited by the transfer switch during the normal operation









1.—10,000 kVA, 1-phase, 110/22 kV transformer showing tap changer attached to its bank

2.—Single-phase "Metrovick" type LP tap changer with covers removed

3.—Transfer switch for 3-phase tap changer with cover removed

4.—Circuit diagram of tap changer showing 5 steps only

and connected into the circuit for suitably brief periods during the tap changing process, by rapid movement of the transfer switch, by stored energy from springs.

The diagram shows four fixed contacts connected to a pair of resistors Rx and Ry. The whole of the transfer switch and resistors, shown enclosed by the dotted line, is mounted at the head of the large porcelain insulator.

In the position shown, selector switch Y is connected to tap 7 and the other selector switch X to the next tap 8. The circuit is completed through one short-circuited resistor Ry with the transfer switch in the right-hand position. To change taps, the transfer switch is rapidly moved over to the opposite side and the selector switch Y moved to the next tap 9 before the gear comes to rest, and is thus ready for the next tap change. The transfer switch movement first removes the short-circuit from the resistor and later bridges the two resistors in series across a pair of tappings. It then completes the circuit to the next tap through the second resistor, and finally short-circuits the latter.

The transfer switches are mechanically operated, double-throw contactors with main and auxiliary contacts, the latter to cause "make before break." The quick motion spring-operated mechanism immediately underneath the contactor is operated by the shaft from the selector switches in the tank below. The transfer switches, resistors, and mechanism are oil immersed in the small tank on top of the insulator. In the tap selector switches, housed in the lower tank, knife-shaped fixed contacts are arranged in two tiers around the fixed collector rings, and circuit is "made" between the selected contact and the ring by a spring-loaded double finger. The motor driving gear and its control are of the same type as previously used on tap changers. Special seals that remain oil tight indefinitely are fitted at the shaft exits from the tanks.

In the case of a bank of three single-phase transformers, the operating shafts are mechanically coupled through bevel gears, universal joints and enclosed tubular shafting to a single motor driving mechanism.

On a three-phase transformer, this type of tap changer can be applied most economically to star-connected windings with tappings arranged at the neutral end, the neutral point being made at the transfer switch itself, so that only very light interphase insulation is necessary.

The LP tap changer is constructed on a separate mechanical unit which can be detached as a whole and the transformer tank blanked up after removal.

ELECTRICITY SUPPLY

Limiting Air-raid Fires. Further Rate Contributions

Billingham-on-Tees.—SHELTER SERVICES.—The Urban District Council is drawing the attention of the Ministry of Home Security to the refusal of Durham County Education Committee to install electric lighting and heating in school shelters.

Crewe.—ELECTRICITY AIDS RATES.—Mr. J. A. Madeley, chairman of the Finance Committee, informed a meeting of the Trades Council and Labour Party recently that the original Corporation estimates showed a big advance upon those of last year. Even when they had been drastically cut it was necessary to transfer £2,500 from the profits of the electricity undertaking to maintain an unchanged rate.

Darlington.—APPLICATION FOR LOAN.—Application is being made to the Electricity Commissioners by the Corporation for sanction to borrow the necessary money for reorganising the coal-handling plant at the generating station.

London.—ISLINGTON.—The Electricity Committee reports that at present, except where meter rents operate, the minimum charge for electricity supply for lighting is at the rate of 10s. per annum and for power at the rate of £1 per annum; it is now proposed to reduce the charge for power to the same figure as for lighting.

CUTTING OFF SUPPLIES.—It was reported to the Stoke Newington Council this week that the Electricity Commissioners had been in communication with the London Fire Forces and the Home Office on the question of cutting off the electricity supply to buildings or areas in the London Region in order to minimise further risk in cases where serious fires were started by air raids. The Commissioners had now indicated that where, under the Defence Regulations, directions were given to an undertaking, requiring supplies to be disconnected in any area it would be the duty of the undertaking to comply and to act in close co-operation with the London Fire Forces. It was understood from the Home Office that any action which it might be necessary for the undertaking to take in order to comply with the directions would not involve the undertaking in any liability, and that if such compliance necessarily involved cutting off electricity from an area larger than that to which the direction related, no liability would attach to the undertaking.

Lyme Regis.—CHANGE-OVER SCHEME.—The Electricity Committee is to obtain the services of a consulting engineer to prepare two schemes—one for the placing of all property on the western side of the borough on the grid supply, the centre of the town to remain DC, and to be supplied from the present station; and the other for placing the whole of the borough on the grid supply.

Middlesbrough.—JOINT METER READINGS.—The borough electrical engineer and the gas engineer are considering a suggestion that meter readers should in future deal with both gas and electricity meters, especially in outside areas, to save man-power.

Rawtenstall.—RATE AID.—At a meeting of the Town Council on April 23rd, Alderman Lord (chairman of the Finance Committee) said they were taking £1,000 from the Electricity Department and £2,000 from the Transport Department to aid the rates.

Southport.—AMALGAMATION NOT FAVOURED.—There was no support at last week's meeting of the Chamber of Trade for a suggestion that as a measure of economy the Corporation electricity and gas undertakings should be merged. One member recalled that years ago there was a merger of the tramways and electricity undertakings and it proved a dismal failure.

TRANSPORT

Darlington.—PROFIT FROM TROLLEY-BUSES.—A statement of accounts submitted to the Corporation shows that during the year ended March 31st the trolley-bus service made a net profit of £11,620.

Middlesbrough. — OVERHEAD - EQUIPMENT ALTERATIONS.—Proposals of the Tees-side Railless Traction Board to alter the poles in Smeaton Street carrying overhead equipment have been approved by the Corporation. It is stated that the existing poles with extending arms are now illegal. Eleven pairs of new poles are to be erected, each pair connected with span wires. A heavier cable to obviate flashing at joints will be fitted.

United States.—MORE ELECTRICALLY DRIVEN VEHICLES.—Last year more electric passenger transport vehicles were purchased by public utilities than in any year since the early 1920's, states *Mass Transportation*. At present there are nearly 7,000 modern vehicles of this type in service in 79 cities, and in towns where war conditions are creating greatly increased traffic old electric cars are being overhauled and brought back into service. From a survey of twenty-six of the largest cities in America our contemporary ascertained that 73.2 per cent. of the passenger transport revenue was derived from electric vehicles.

Trinidad's Overseas Trade

Improved Purchasing Capacity.

SOME striking changes took place in the export and import trade of Trinidad during 1940. The former benefited from the rise in the demand for oil products, which compensated for the decline in shipments of sugar. At the same time there were noteworthy increases in shipments of cocoa and grapefruit. On the import side, while the United Kingdom remained Trinidad's chief source of supply, the feature was an advance in Canada's position to 21 per cent. of all goods entered, against 14 per cent. in 1939. The share of the United States increased to 28 per cent. compared with 25 per cent. Imports as a whole were over 25 per cent. up on 1939, owing for the most part to the increased demand for constructional materials and metal goods.

Under the influence of an increased demand for labour and supplies in connection with the United States bases, the purchasing capacity of the island has continued to improve. There have been changes in the structure of the export trade, shipments of grapefruit to the United Kingdom, for example, being replaced by shipments of the juice to Canada. Where import trade has increased, Canada has been the principal supplier, but no increases have been permitted in non-essential imports.

Below are given the values of the chief electrical goods imported in 1940, with notes of increases or decreases compared with 1939. The figures have been extracted from the external trade returns of the Colony issued in Port of Spain.

	1940 $ (000)	Inc. or dec.
Insulated wires and cables—		
Total	188	− 26
From United Kingdom	159	− 34
„ United States	20	+ 7
„ Canada	8	+ 6
Primary batteries—		
Total	28	—
From United Kingdom	12	+ 10
„ United States	5	− 19
„ Canada	11	+ 9
Cooking and heating appliances—		
Total	36	+ 32
From United Kingdom	21	+ 18
„ Canada	12	+ 12
Electric stoves—		
Total	26	+ 22
From United Kingdom	15	+ 12
„ Canada	10	+ 10
Electrical refrigerators—		
Total	78	+ 39
From United Kingdom	21	+ 20
„ United States	32	− 6
„ Canada	25	+ 25
Goods and apparatus, n.o.p.—		
Total	221	− 102
From United Kingdom	104	− 123
„ United States	73	− 1
„ Canada	42	+ 25

	1940 $ (000)	Inc. or dec.
Electrical machinery—		
Total	214	− 44
From United Kingdom	119	− 70
„ United States	62	+ 12
„ Canada	10	—
Radio apparatus—		
Total	75	− 13
From United Kingdom	39	+ 15
„ United States	31	− 25
Other telegraph and telephone apparatus—		
Total	112	+ 81
From United Kingdom	104	+ 83
Lamps under 20V—		
Total	11	+ 5
From United Kingdom	6	+ 5
„ United States	3	− 1
Lamps over 20V—		
Total	39	+ 17
From United Kingdom	35	+ 21
„ United States	3	− 4
Other lighting appliances—		
Total	22	− 9
From United Kingdom	14	—
„ United States	5	− 4
Accumulators and parts—		
Total	31	+ 6
From Canada	23	+ 8

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Switchgear & Cowans, Ltd., report a profit for 1941, including results from subsidiaries, of £27,688, which compares with £39,333 for the previous year. After allocating £4,756 (£2,848) to A.R.P. expenditure, £12,819 (£23,500) to taxation, £2,312 (nil) to war contingencies and nil (£2,000) to general reserve, a dividend of 10 per cent. (15 per cent.) is paid, leaving £8,281 (£6,480) to be carried forward.

Hall Telephone Accessories, Ltd., report a rise in profits from £68,640 in 1940 to £152,573 in 1941, but the allocation to reserve for taxation increases from £38,200 to £105,000. General reserve receives £20,000 (against £10,000) and a final dividend of 5 per cent. with a bonus of 2½ per cent. is being paid, making 12½ per cent. for the year, against 10 per cent.

The Rawlplug Co., Ltd., shows a net profit of £63,678 for 1941 after meeting taxation, as compared with £63,548 for 1940. The final dividend is 30 per cent., again making 40 per cent. for the year. The report states that in spite of the loss of European and other markets there was a substantial increase in turnover. The capital and trading interests in the French and German subsidiaries have been written off.

Ozonair, Ltd., report a profit of £1,855 for 1941, as compared with £1,726 for the preceding year. After providing for fees and depreciation there remains £1,337 (£1,236) to which is added £1,477 brought in. After providing for preference dividends and an ordinary dividend of 7 per cent (same) £1,679 is carried forward.

Laurence, Scott & Electromotors, Ltd.—From a net profit of £95,856 (against £119,178) it is proposed to pay a dividend of 12½ per cent. (against 15 per cent.) on the "A" and "B" ordinary shares.

The Brush Electrical Engineering Co., Ltd., has declared a dividend of 6 per cent. for the past year. Nothing was paid for the preceding year.

The London Passenger Transport Board has applied to Parliament for leave to introduce in the present Session a Bill to confer further powers upon the Board with respect to the creation and issue of Transport Stock and for other purposes.

The Sphere Investment Trust, Ltd., announces a net revenue of £36,243 for the past year (against £41,941). The dividend is maintained at 5 per cent.

The Canadian General Electric Co.'s report for 1941 shows sharply increased operating profits, as the volume of orders received rose to the highest level in the company's history. After providing for all charges, however, including increased provision for depreciation ($1,137,539 as compared with $823,454), income tax ($6,600,000 against $3,004,905) and transfer of $750,000 (nil) to working reserves, the net profit was only slightly higher ($2,479,555 against $2,308,019). This net profit was equal, after paying preferred dividends, to $12.57 per common share against $11.66 for 1940. After paying dividends, $863,795 has been added to the carry-forward, which now stands at $10,519,305. In presenting the report M. D. C. Durland, chairman and president, states that a large part of the company's manufacturing capacity was devoted to the production of a wide range of special war equipment.

The Western Union Telegraph Co., reports a net income of $7,366,000 for 1941, after meeting Federal taxes, as compared with $3,621,000 for 1940. Two dividends of $1 each have been paid and the surplus at the close of the year was $71,333,576.

The Ever Ready Co. (Great Britain), Ltd., announces the payment of a final dividend of 20 per cent. and a bonus of 5 per cent., maintaining the year's distribution at 40 per cent.

The Atlas Electrical & General Trust, Ltd., has declared a final dividend of 3½ per cent. on the 7 per cent. preference shares, making up the full dividend for the past year.

Allen West & Co., Ltd., report a net profit of £50,195 for 1941 (against £51,931 for 1940). The ordinary dividend is maintained at 7½ per cent.

The Southern Areas Electric Corporation, Ltd., is to pay a first and final dividend of 5 per cent. (same).

The Mersey Power Co., Ltd., is to pay a first and final dividend of 8 per cent. (same).

The Cables Investment Trust, Ltd., has declared an interim dividend of 2 per cent., as last year.

Broom & Wade, Ltd., are again paying an interim dividend of 7½ per cent.

New Companies

Kingsbury Winding Co., Ltd. — Private company. Registered April 18th. Capital, £200. Objects: To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries and electrical supplies, etc. Directors: W. F. Cropley, 6A, Tudor Broadway, N.W.9, director of A. M. Cropley, Ltd., and Marguerite L. Wilkins, Tudor House, Kingsbury Lane, N.W.9. Registered office: 6A, Tudor Broadway, Kingsbury Lane, N.W.9.

Auto-Sparks, Ltd. — Private company. Registered April 18th. Capital, £2,000. Objects: to carry on the business of electrical, lighting, heating, telephone, wireless, television, motor, mechanical and general engineers, etc. Directors: Henri R. Colomb, and Marion A. Colomb, both of 35, Gorton Road, Willerby, E. Yorks. Registered office: 103A, Beverley Road, Hull.

Sea Rescue Equipment, Ltd.—Private company. Registered April 15th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, electrical and artificial lighting apparatus, lamps and accessories, buoy lamps,

sea safety torches, wireless apparatus, sea safety devices, etc. Directors: A. S. Poynton, 19, Brushwood Drive, Chorley Wood, Herts., and E. L. Gardiner, 9, Norwich Road, Northwood, Mdx. Registered office: Revenue House, 7–8, Poultry, E.C.2.

Rogerson (Insulation), Ltd.—Private company. Registered April 20th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, sound reproducing machines, insulating materials, radio receivers, accumulators, batteries, wireless and electrical components and accessories, etc. Directors: C. Russell, 137, Oakleigh Park Drive, Leigh-on-Sea and J. F. Rogerson, 75, Linden Gardens, W.2. Registered office: 2, Northcourt, Chitty Street, W.1.

W. T. Hales (Pontypool), Ltd.—Private company. Registered April 20th. Capital, £1,000. Objects: To carry on the business of radio, television, electrical, motor, mechanical and general engineers, manufacturers and repairers of, and dealers in, radio sets, radiograms, gramophones and electric cooking, heating and domestic apparatus, etc. Directors: W. T. Hales and Elizabeth A. Hales, both of 64, George Street, Pontypool, Mon. Registered office: 64, George Street, Pontypool, Mon.

Carlton Electrical Appliances, Ltd.—Private company. Registered April 9th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers in, electric light bulbs, electric stoves, ovens, radiators, refrigerators, shades, torches, radio transmitting and receiving sets, valves and accessories, tools, etc. Subscribers: E. J. Newman, 25, Cecil Avenue, Gidea Park, Essex, and A. H. Palmer, 46, Heddon Court, Cockfosters, Herts. Solicitors: Norton, Rose, Greenwell & Co., London, E.C.2.

A. F. Collins (Refrigeration), Ltd.—Private company. Registered April 11th. Capital, £100. Objects: To carry on the business of electrical and general engineers, manufacturers of, and dealers in, refrigerators, etc. Directors: R. Large, A. F. Collins and H. W. Barker. Registered office: 16, Albemarle Street, W.1.

Companies' Returns

Statements of Capital

Berry's Electric, Ltd.—Capital, £225,000 in 450,000 shares of 10s. Return dated October 16th. 282,007 shares taken up. £1,003 10s. paid on 2,007 shares. £140,000 considered as paid on 280,000 shares. Mortgages and charges: £44,900

Delhi Electric Supply & Traction Co., Ltd.—Capital, £200,000 in £1 shares. Return dated September 11th (filed December 8th). All shares taken up. £121,000 paid. £79,000 considered as paid. Mortgages and charges: Nil.

Laypak Battery Co., Ltd.—Capital, £2,100 in 2,000 6 per cent. preference shares of £1 each and 2,000 ordinary shares of 1s. each. Return dated December 31st. 1,650 preference and 1,600 ordinary shares taken up. £1,400 paid. £330 considered as paid. Mortgages and charges: Nil.

George H. Scholes & Co., Ltd.—Capital, £8,500 in £1 shares (5,000 preference, 3,000 preferred ordinary and 500 ordinary). Return dated December 31st, 1941. 4,482 preference, 3,000 preferred ordinary and 500 ordinary shares taken up. £5,098 paid. £2,884 considered as paid. Mortgages and charges: Nil.

A. O. Gibbons, Ltd.—Capital, £5,900 in 2,000 7 per cent. non-cumulative preference and 3,900 ordinary shares of £1. Return dated January 13th, 1942. 1,845 preference and 3,400 ordinary shares taken up. £4,246 paid on 1,845 preference and 2,401 ordinary shares. £999 considered as paid on 999 ordinary shares. Mortgages and charges: £2,100.

Fairbourne Development Co., Ltd.—Capital, £1,000 in 1,000 ordinary shares of £1 each. Return dated December 31st, 1941. 660 shares taken up. £660 paid. Mortgages and charges: Nil.

Mortgages and Charges

G. R. Scott and Co., Ltd.—Debenture, charged on the company's undertaking and property, including uncalled capital, dated March 25th, to secure £500. Holder: Miss M. Brown, The Grange, Wendover, Bucks.

Underwood (Electric), Ltd.—Assignment of contract moneys, dated April 2nd, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £600.

Riley and Neate, Ltd.—Mortgage on contract moneys, dated March 30th, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Mitchell Electric, Ltd.—Mortgage on contract moneys, dated April 2nd, to secure all moneys due or to become due from the company to Westminster Bank, Ltd.

Receiver Released

Evrizone Radio & Television Co., Ltd.—P. Wickenden, 12, Lonsdale Gardens, Tunbridge Wells, ceased to act as receiver and manager on April 10th.

Bankruptcies

A. E. Baker, electrical engineer, 42, Chapel Road, Bexley Heath, Kent.—This application for discharge was heard recently at the Court House, Eastgate, Rochester. The receiving order was made in 1937, when the liabilities amounted to more than £1,700. The assets had only realised £61. It was stated that the debtor commenced trading in 1935 with money which he borrowed. He was now in employment as manager of an electrical firm at a salary of £8 a week. The discharge was granted, subject to one month's suspension.

R. T. Davies, journeyman electrician, 15, Greymont Road, Bury, and lately carrying on business as a radio engineer at 187, The Rock, and 65, Bolton Road, Bury.—Proofs for dividend by May 6th to the trustee, Mr. F. H. Langmaid, 20, Byrom Street, Manchester.

Liquidations

Birkdale District Electric Supply Co., Ltd.—Winding up voluntarily. Joint liquidators, Messrs. F. J. Cursons and G. H. Humphries, 88 Kingsway, London, W.C.2.

STOCKS AND SHARES

TUESDAY EVENING.

ON Thursday in this week the Government is introducing a new series of 3 per cent. Savings Bonds. These will be offered at 100 and dated 1960/70. The previous issue, which comes to an end on Wednesday in this week, bears date 1955/65, so that the Government, although offering the same terms, extends the redemption period by five years in the new series.

This latest issue is an oblique bull point for gilt-edged securities. It emphasises the Government's determination to continue its cheap money policy, and it throws into further relief the attractions of gilt-edged stocks that offer better terms to the investor. Consequently, prices in the markets for front-rank stocks and shares, together with those of trustee securities, are generally a little harder.

Home Railway Profits

Home Railway stocks improved sharply upon notification that the net revenue of the Government-controlled Home Railway Pool for the year ended December 1941 was £65 millions. It will be remembered that the Government agreed to pay the controlled railway companies £43½ millions. Therefore the Government made a profit, as it may be called, of £21½ millions out of the net revenue of the companies in 1941. The figures aroused surprise; they drew blunt condemnation of the Government's previous bargain with the companies. As against this, however, it was argued that as the £21½ millions "profit" has accrued almost entirely as the result of war traffic—troops, munitions and the like—there is no genuine cause for complaint on the part of Home Railway stockholders. The figures published by the Treasury strengthen the position of the fixed dividend and fixed-interest stocks. Interest and dividends are being well earned and the buyers of to-day can reasonably rely upon last year's distributions being repeated, at any rate for several years to come.

Replacement of Stocks

Most industrial companies which include debenture debts in their capital obligations, are watching very closely the developments in that trend of investment which seeks to replace existing charges with others bearing a lower rate of interest. In some cases a company has sufficient money with which to pay off the whole of a debenture issue. Instances are known in which a company has accumulated cash for which it has no immediate use, and, having regard to the present condition of the money market, the opportunity for repaying a debenture or other such debt offers a convenient chance for disbursing the money. Where a front-rank company has a 5 per cent. debenture issue that can be repaid at an early date, the temptation to redeem the stock, and to substitute another which gives a lower rate of interest, is obviously great. The present-day buyer of debenture stocks should pay particular heed to the redemption terms attached to the stock. Negligence in this matter may easily lead to unpleasant surprises later on.

Loss on Redemption

As an example, West Midlands J.E.A. 5 per cent. stock, which can be bought at 110 free of stamp, gives an immediate yield of 4½ per cent. on the money. The stock is redeemable at 100 in 1968, or at any time after March, 1948, also at 100. The austere manner of calculating the yield is to take the earliest date at which a stock priced over par can be paid off, so that if allowance is made for a conceivable 10 point loss of capital at the end of six years, the yield on the money is reduced to £3 0s. 6d. per cent.

North Metropolitan Power Station 3½ per cent. second debenture stock, which is on offer at 102½, becomes repayable at par by 1965, but can be paid off any time after September, 1951, at 100. The flat return at 102½ is £3 8s. 3d. per cent. If the issue is redeemed at 100 in 1951, the earliest possible time, the income is reduced to £3 3s. 6d. per cent.

Fuel Rationing

Announcement of the Government's scheme for the rationing of fuel, coal, gas, electricity and paraffin, met with a very mixed reception in the House of Commons. In the Stock Exchange market, the prices of shares in companies connected with the electricity supply industry were virtually unchanged. The scheme itself came in for sharp criticism: so sharp, indeed, as to stimulate the impression that the details will have to be modified before the plan comes into operation.

Dividends and Prices

The Ever Ready Co. has declared a dividend of 25 per cent., making 40 per cent. for the full year; the same as that for the previous twelve months. This excellent result was generally expected. The price of the shares is 6d. better at 31s. 6d. cum. dividend, which gives a return of £6 7s. 0d. per cent. on the money. Hopkinsons are 9d. up at 47s. Allen West, in declaring a 7½ per cent. dividend, repeat the performance of a year ago; the shares at 5s. 9d. give 6½ per cent. on the money. An improvement of 6d. lifted Tube Investment shares to 82s. 6d. General Electrics hold their rise to 83s. 9d. Hall

(*Concluded on page* 578)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Apl. 28	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	55/-	..	4 11 0
British Power and Light	6	6	28/6	..	4 4 3
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	40/-	..	4 0 0
County of London	8	8	37/6	..	4 5 6
Edmundson's: 7% Pref.	7	7	35/-	..	4 0 0
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	41/3	−⅛	4 7 3
Elec. Fin. and Securities	12½	12½	47/6	..	5 5 2
Elec. Supply Corporation	10	10	45/-	..	4 9 0
Isle of Thanet	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	35/-	..	4 5 9
Llanelly Elec.	5½	5½	22/-	..	5 0 0
Lond. Assoc. Electric	4½	4	18/3	..	4 7 8
London Electric	6	6	25/-	..	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	36/3	..	4 8 6
Midland Counties	8	8	39/6	..	4 1 0
Mid. Elec. Power	9	9	42/-	..	4 5 9
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary	7	7	31/3	..	4 9 7
7% Pref.	7	7	34/6	..	4 1 2
Northampton	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power: Ordinary	7	7	35/9	..	3 18 4
6% Pref.	6	6	32/6	..	3 13 10
Richmond Elec.	6	6	25/-	..	4 16 0
Scottish Power	8	8	39/6	..	4 1 0
Southern Areas	5	5	21/3	..	4 14 0
South London	7	7	26/-	..	5 7 8
West Devon	5	5	22/-	+9d.	4 11 0
West Glos.	4½	4½	22/6	..	4 0 0
Yorkshire Elec.	8	8	40/-	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/-	..	—
Calcutta Elec.	8*	7*	18/3	−6d.	—
Cawnpore Elec.	10	10	25/-	..	8 0 0
East African Power	7	7	27/-	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/-)	7½	7½	9/6	..	7 12 10
Madras Elec.	6*	4*	15/-	..	5 6 8
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec.	6	7	5/-	..	—
Shawinigan Power	83cts.	90cts.	15½	..	—
Tokyo Elec. 6%	6	6	12½	..	—
Victoria Falls Power	15	15	71/3	−⅛	4 4 0
Whitehall Inv. Pref.	7½	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Apl. 28	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity: 1950–70	5	5	110½	..	4 10 6
1955–75	5	5	115	+1	4 7 0
1951–73	4½	4½	109	..	4 2 7
1963–93	3½	3½	104	..	3 7 4
1974–94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	94	..	2 13 2
London & Home Counties 1955–75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.: A	4½	4½	120½	..	3 14 9
B	5	5	118½	..	4 4 5
C	3	2½	40½	..	7 2 0
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo.-Am. Tel.: Pref.	6	6	110½	..	5 8 8
Def.	1½	1½	25	..	6 0 0
Anglo-Portuguese	8	8	12/6	−⅛	12 16 0
Cable & Wireless: 5½ Pref.	5½	5½	93xd	−½	5 18 3
Ord.	4	4	52	..	7 13 10
Canadian Marconi $1	Nil	4cts.	5/-	−6d.	3 7 0
Globe Tel. & Tel.: Ord.	8½*	8½*	26/3	..	—
Pref.	6	6	26/3	..	4 11 5
Great Northern Tel.: (£10)	20	20	13½	+½	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	30/-	..	5 0 0
Oriental Tel. Ord.	11½*	16	45/-	..	7 2 3
Telephone Props.	6	Nil	8/9	..	—
Tele. Rentals (5/-)	10	10	8/9	−3d.	5 14 1
Traction and Transport					
Anglo. Arg. Trans.: First Pref. (£5)	Nil	Nil	5/-	..	—
4% Inc.	Nil	Nil	5½	..	—
Brit. Elec. Traction: Def. Ord.	45	45	915	..	4 18 3
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	8	10	45/-	..	4 9 0
Brazil Traction	$1	50c.	13½	+½	—
Calcutta Trams	8	5½	10/-	−½	11 0 0
Cape Elec. Trams.	5	5	19/-	..	5 5 3
Lancs Transport	10	10	45/-	..	4 9 0
Mexican Light: 1st Bonds	5	5	77½	..	6 9 0
Rio 5% Bonds	5	5	96½	..	5 3 8
Southern Rly.: 5% Prefd.	5	5	63½	..	7 17 6
5% Pref.	5	5	111½	..	4 9 6
T. Tilling	10	10	49/6	..	4 1 2
Tilling & B.A.	7*	6½*	55/-	..	2 7 3
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Apl. 28	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	24/–	..	6 5 0
Assoc. Elec.:					
Ord.	10	10	45/–	..	4 9 0
Pref.	8	8	38/9	..	4 2 4
Automatic Tel.& El.	12½	12½	48/9	+⅛	5• 2 6
Babcock & Wilcox	11	11	44/6	..	4 18 9
British Aluminium	10	10	43/3	..	4 12 4
British Insul. Ord.	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	14/6	..	6 7 6
British Vac. Cleaner (5/–)	12½	10	11/3	..	4 9 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	72/6	..	4 2 9
Chloride Elec.Storage	15	15	75/–	..	4 0 0
Cole, E. K. (5/–) ..	Nil	7	11/0	–3d.	3 3 8
Consolidated Signal	17	17	75/–	..	4 10 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	14/–	..	4 5 9
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	55/–	..	4 11 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	40/–	..	5 0 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	22•	20•	41/3	..	2 8 6
Ever Ready (5/–) ..	40	40	31/6	+6d.	6 7 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	35/–	..	3 14 2
Ord.	20	17½	85/9	..	4 3 9
Greenwood & Batley	15	13	28/9	..	9 0 10
Hall Telephone(10/-)	10	12½	17/6	+⅛	7 2 10
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons	15	15	47/–	+9d.	6 7 10
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	65/–	..	6 3 1
Laurence,Scott (5/–)	15	12½	11/–	..	5 14 0
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	65/–	–⅛	4 12 4
Mather & Platt ..	10	10	38/9	..	5 3 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	..	4 6 9
Pye Deferred (5/–)	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)..	2	4	3/3	..	6 3 1
Switchgear & Cowans (5/–).. ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg.(5/–)	9	9	9/3	..	4 17 3
Tube Investments	23¾	20	82/6	+6d.	4 17 0
Vactric (5/–) ..	4	Nil	5/6	..	—
Vickers (10/–) ..	10	10	16/6	..	6 1 5
Ward & Goldstone (5/–)	20	20	18/6	..	5 8 3
Westinghouse Brake	10	10	47/6	..	4 4 2
WalsallConduits(4/-)	55	55	33/9	..	6 10 4
West, Allen (5/–) ..	7½	7½	5/9	..	6 10 5

• Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 576)

Telephones have advanced to 17s. 6d. and Automatic Telephones to 48s. 9d., on the assumption that companies connected with this branch of work must be doing exceptionally well at the present time. Anglo-Portuguese Telephone weakened to 12s. 6d. on fears lest the dividend of 8 per cent. may be reduced. Great Northern Telegraphs are nominally 10s. higher at 15¼. Telephone Rentals at 8s. 9d. are a few pence easier.

Indian electricity shares are dull in tone; Calcutta Electrics are down to 18s. 3d., and Calcutta Trams to 10s. Victoria Falls have reacted to 71s. 3d. Brazilian Tractions are a better market, with ½ rise to 13¼.

Cable and Wireless

Cables Investment Trust has declared an interim dividend of 2 per cent., less tax, on the ordinary stock. For last year the full dividend was 5 per cent. The ordinary stock is all held privately: one half by the Globe Telegraph & Trust Company, the other by Cable and Wireless. Therefore there is no Stock Exchange market for the stock. The 4½ per cent. preference shares stand at 21s. 6d.; the 3½ per cent. debenture is quoted at 97. These are redeemable at 21s. and 101 respectively. There is not much market in either. Cable and Wireless preference stock at 93 ex dividend is about 10s. lower, allowing for the dividend deduction. The ordinary is unchanged at 52.

Lines of Industrials

Confirmation of the statement made here so frequently, that no difficulty attends the sale of good securities may be found in the considerable realisations which have recently taken place in the Stock Exchange markets in order to provide money for death duties. One very large estate included large blocks of ordinary shares, as well as a good many preference shares, and a fair amount of gilt-edged stock. The ordinary shares are being placed in lines at a time, without the sales having any depressing effect upon the previous prices. An illustration, this, of the remarkable absorption power of the industrial markets as a whole. Indicative, also, of the pressure of investment demand, and of the amount of money that is available for employment in good-class securities.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Birkenhead.—May 18th. Electricity Department. Cables, meters and general stores. (See this issue.)

Hastings.—May 16th. Electricity Department. Boiler fuel. (See this issue.)

Manchester.—May 7th. Electricity Department. Two 120-ton coal conveyors and eight coal wagon tippers. (April 24th.)

May 11th. Rivers Committee. Electrical equipment in connection with the installation of an additional compressor at the Davyhulme sewage works. (See this issue.)

South Africa.—SALISBURY.—July 2nd. City Council. Electrical metering equipment (Contract E.19).

KENHARDT.—June 24th. Municipality. Plant for electricity supply undertaking.

UPINGTON.—June 24th. Municipality. Electrical plant (alternator, switchboard, meters, crude oil engine, etc.).

Orders Placed

Darlington. — Corporation. Accepted. Transformers.—Hackbridge Cable Co., Ltd. (£278); Yorkshire Electric Transformer Co. (£397).

Middlesbrough.—Corporation. Accepted. Low-voltage cable (£146).—Hackbridge Cable Co., Ltd. Cable for transporter bridge (£70).—Britannic Cable Co., Ltd.

Workington.—Electricity Committee. Accepted. Cables for twelve months.—British Insulated Cables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Combined depots for civil defence (electrical and heating works); A. B. Gardner, city architect, Municipal Offices.

Bacup.—Hostel for firemen; H. Guffogg, borough surveyor, Stubbylee Hall.

Bowdon.—Flats, Oldfield Bank; L. Lowe, Oldfield Bank, Bowden, Cheshire.

Bradford.—British Restaurant, Usher Street Schools; H. Connolly, city architect, Town Hall.

Chester.—Additions; Anchor Motor Co.

Chesterfield.—British Restaurant; W. S. Wilson, borough surveyor, Town Hall.

Coventry.—Youth Institute; F. H. Harrod, director of education.

Shelters, with canteens, electric light, heating, etc.; D. E. E. Gibson, city architect, 1A, Warwick Row.

Darlington.—Canteen at the Grammar School for the E.C. (£680); E. Minors, borough engineer.

Doncaster.—Canteen, Thorne Collieries; Pease & Partners, Ltd., colliery proprietors, 20, Northgate, Darlington.

Durham.—Additional classrooms at Hart School (£900) and provision of meals facilities at a further 43 schools; county architect, 34, Old Elvet, Durham.

Esher.—British Restaurant at the Parade, Claygate (£1,357); surveyor, Council Offices, 1, High Street.

Gateshead-on-Tyne.—Canteen at the North Eastern Trading Estate; S. Miller, 17, North Street, Newcastle-on-Tyne.

Grays.—Adaptation of 7, Palmers Avenue, as a nursery (£1,000), for Thurrock U.D.C.; surveyor, Council Offices, Whitehall Lane, Grays, Tilbury.

Greenock.—Sailors' Rest; British Sailors' Society.

Restoration work at Municipal Buildings £6,000); burgh surveyor.

Harwich. — School clinics; H. French, borough surveyor.

Hoylandswaine (Yorks.).—Canteen at colliery; Guyger Bottom Colliery Co., Ltd.

Hyde.—Extensions to Borough Hospital; T. H. Higson, borough surveyor, Town Hall.

Central kitchen and store; Moston Brick & Building Co., Ltd., builders, Kenyon Lane, Moston, Manchester.

Isle of Wight.—New kitchen at Sandown Secondary School; county architect, County Hall, Newport.

Jarrow-on-Tyne.—Shelters at rest centres; D. Glen, Back Queen's Road.

Kippax.—Canteen, Victoria Colliery; T. & R. W. Bowers, Ltd., colliery owners, Prudential Buildings, Park Row, Leeds.

London. — HACKNEY. — Canteen, Millfields generating station (£2,900) for Electricity Committee.

FULHAM.—A.R.P. buildings (£3,400); borough engineer.

Nursery, Maxwell Road (£935); borough engineer.

L.C.C.—Emergency staff accommodation, County Hall; county architect.

Normanton.—Canteen, Fox and New Collieries; Pope & Pearson, Ltd., West Riding Collieries.

Three canteens at collieries; Briggs Collieries, Ltd., Whitwood.

Nottingham.—Completion of block at Sneinton Dale Council School (£4,897); J. E. Richards, town clerk, Guildhall.

Pontefract.—Canteen; Ackton Hall Colliery Co., Ltd., Ropergate Chambers.

Rainhill.—British Restaurant off Warrington Road (£1,350), for Whiston R.D.C.; Clerk's Department, Council Offices, Prescot.

Shropshire.—School canteens at Much Wenlock and Hodnet, and canteen facilities and equipment at other centres; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Sidcup.—Cleansing station (£1,320), for Chislehurst and Sidcup U.D.C.; E. T. Chater, clerk, Council Offices, Sidcup Place, Sidcup, Kent.

Stirling.—Cleansing station; county architect, County offices, Stirling.

Stockton-on-Tees. — Workshop; Ashmore, Benson Pease & Co.

Stretford.—Additions; Craigielea Joinery Works Co., Ltd.

Five wartime nurseries; E. Parker, borough engineer, Town Hall.

Uttoxeter.—British Restaurant; Beddoes & O'Dair, builders, Uttoxeter Road, Tean, near Stoke-on-Trent.

Watford.—Additional accommodation at Kingsway School (£3,300) for Herts Education Committee; Clerk's Department, Castle Street, Hertford.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.*2.

1940

8763. "Electric wave transmission devices." Telephone Manufacturing Co., Ltd., and L. H. Paddle. April 23rd, 1941. (544250.)

9643. "Multi-armature ignition magnetos." J. Bernard. July 4th, 1939. (544223.)

9702. "Method of preparing a luminescent mixture." Mullard Radio Valve Co., Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 3rd, 1940. (Convention date not granted.) (544224.)

9704. "Electric-discharge tubes comprising secondary emission electrodes." Mullard Radio Valve Co., Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 3rd, 1940. (Convention date not granted.) (544225.)

10170. "Means for giving warning of the formation of ice on aircraft." British Thermostat Co., Ltd., and J. E. Sherlock. June 11th, 1940. (544226.)

13511. "Luminescent materials." General Electric Co., Ltd., A. H. McKeag and P. W. Ranby. August 27th, 1940. (544160.)

14713. "Electron-discharge devices and arrangements including such devices." Marconi's Wireless Telegraph Co., Ltd. September 30th, 1939. (544232.)

14827. "Centrifugally operated switches." Heenan & Froude, Ltd. (Lee Engineering Research Corporation). October 3rd, 1940. (544235.)

14837. "Automatic regulators to control the temperature time cycle in heating or cooking plants or the like." Electroflo Meters Co. Ltd., A. Wright and A. Smithson. November 3rd, 1940. (544163.)

14879. "Steam generating and superheating installations." Superheater Co., Ltd., and E. A. Robinson. October 4th, 1940. (Addition to 543987.) (544193.)

15707. "Joints and terminals of high-tension electric cables." Callender's Cable & Construction Co., Ltd., and W. F. Ellis. October 25th, 1940. (544166.)

16675. "Gaseous electric-discharge devices." General Electric Co., Ltd., and B. N. Clack. November 19th, 1940. (544259.)

17094. "Electrical indicating instruments." Simmonds Development Corporation, Ltd. November 20th, 1939. (544168.)

1941

236. "Electric motor controllers." Igranic Electric Co., Ltd., and J. R. Taylor. January 7th, 1941. (544169.)

267. "Polyphase heteropolar inductor machines." British Thomson-Houston Co., Ltd., W. R. Holland and J. H. Walker. January 8th, 1941. (544205.)

365. "Hinged connections." Callender's Cable & Construction Co., Ltd., F. King and S. J. Wood. January 10th, 1941. (544206.)

468. "Electric spark gaps." Lodge Plugs, Ltd., and C. J. Smithells. January 13th, 1941. (544264.)

519. "Carbon pile electric regulators." F. Newton. January 14th, 1941. (Addition to 514482.) (Cognate application, 9528/41.) (544170.)

1287. "Negative feed-back thermionic amplifiers." Standard Telephones & Cables, Ltd. February 2nd, 1940. (544175.)

1311. "Welding electrodes." A. V. Roe & Co., Ltd., and R. F. Taylor. January 31st, 1941. (544176.)

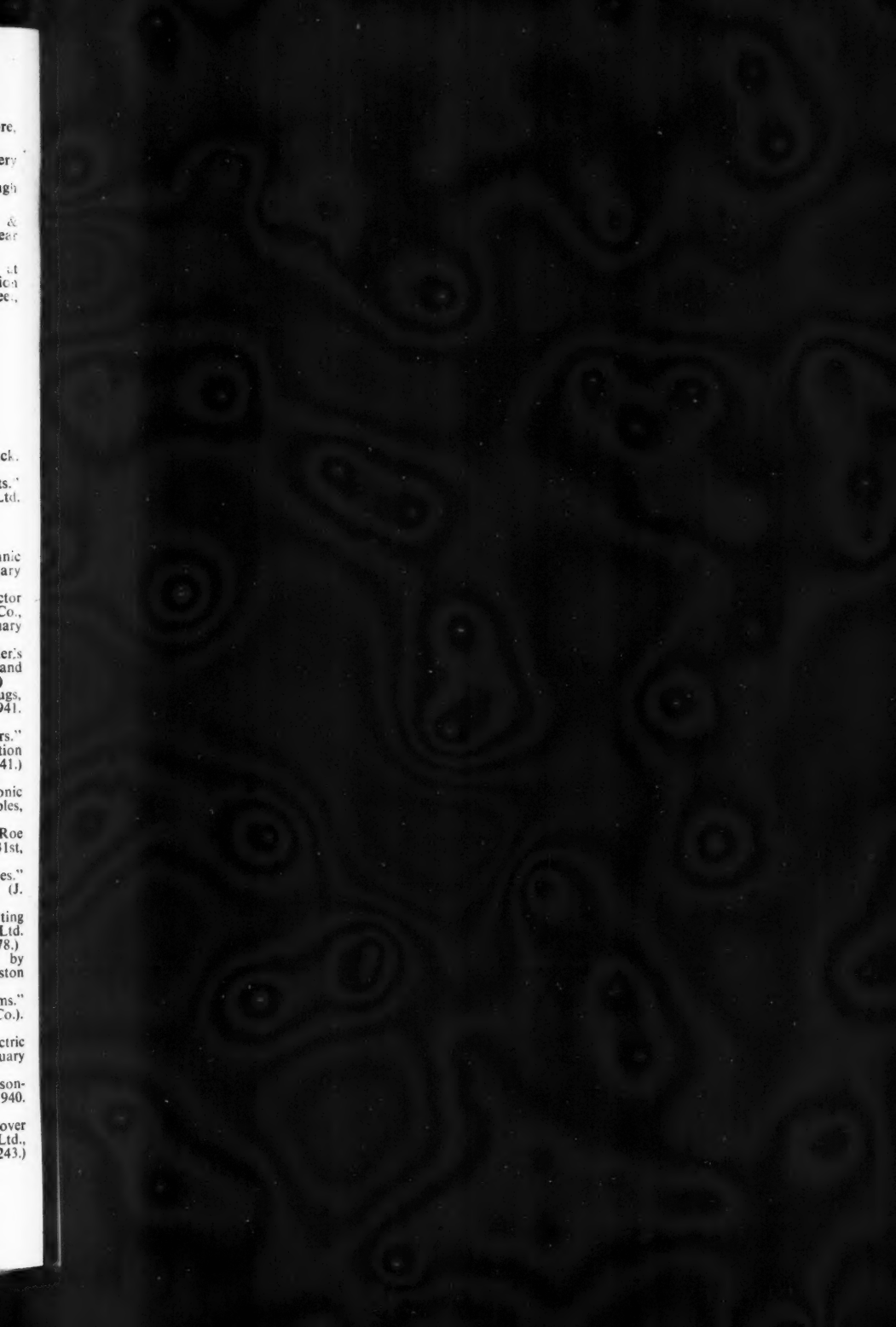
1323. "Electric glass-melting furnaces." British Thomson-Houston Co., Ltd. (J. Ferguson). January 31st, 1941. (544177.)

1324. "Discharge orifice for glass-melting furnaces." British Thomson-Houston Co., Ltd. (J. Ferguson). January 31st, 1941. (544178.)

1371. "Control of electric currents by saturable reactors." British Thomson-Houston Co., Ltd. February 1st, 1940. (544180.)

1485. "Electric motor control systems." W. W. Triggs (Niles-Bement-Pond Co.). February 1st, 1941. (544209.)

1572. "Shackles." North British Electric Welding Co., Ltd., and T. S. Glover. February 6th, 1941. (544267.)

1906. "X-ray apparatus." British Thomson-Houston Co., Ltd. February 12th, 1940. (544236.)

4719. "Means of communication over power mains." General Electric Co., Ltd., and A. A. Chubb. April 9th, 1941. (544243.)